

# VU Research Portal

## **The economic value of peatland resources within the Central Kalimantan Peatland Project in Indonesia: perceptions of local communities**

van Beukering, P.J.H.; Schaafsma, M.; Davies, O.; Oskolokaite, I.

2008

### **document version**

Publisher's PDF, also known as Version of record

[Link to publication in VU Research Portal](#)

### **citation for published version (APA)**

van Beukering, P. J. H., Schaafsma, M., Davies, O., & Oskolokaite, I. (2008). *The economic value of peatland resources within the Central Kalimantan Peatland Project in Indonesia: perceptions of local communities*. (IVM Report; No. E-08/05). Instituut voor Milieuvraagstukken, Vrije Universiteit.

### **General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal ?

### **Take down policy**

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

### **E-mail address:**

[vuresearchportal.ub@vu.nl](mailto:vuresearchportal.ub@vu.nl)

# **The economic value of peatland resources within the Central Kalimantan Peatland Project in Indonesia**

**Perceptions of local communities**

Pieter van Beukering

Marije Schaafsma

Olwen Davies

Ieva Oskolokaite



Report E-08/05

June 28, 2008

This report was commissioned by: Wetlands International and the University Palangkaraya under the Central Kalimantan Peatlands Project (CKPP); financially supported by DGIS, the Netherlands Government.

It was internally reviewed by: Luke Brander

#### IVM

Institute for Environmental Studies  
Vrije Universiteit  
De Boelelaan 1087  
1081 HV Amsterdam  
The Netherlands

T +31-20-5989 555  
F +31-20-5989 553  
E [info@ivm.vu.nl](mailto:info@ivm.vu.nl)

#### **Copyright © 2008, Institute for Environmental Studies**

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without the prior written permission of the copyright holder.

## Contents

Acknowledgements	iii
Abstract	v
1. Introduction	1
2. Context	5
2.1 Introduction	5
2.2 Chemical and biological characteristics of peatlands	5
2.3 Functions and values of peatlands	5
2.4 Direct causes of peat degradation	7
2.5 Indirect causes of peatland degradation	10
2.6 Capturing economic benefits of peatlands	14
2.7 Recommendations for sustainable peatland management	16
3. Methodology	19
3.1 Multidisciplinary approach	19
3.2 Sample design	20
3.3 Qualitative analysis	22
3.4 Quantitative analysis	24
3.5 Practical constraints and reliability of data	26
4. Qualitative analysis	27
4.1 Introduction	27
4.2 Canal blocking	27
4.3 Use and ban of fire	28
4.4 Land use and land use change	31
4.5 Compensation and trust	34
4.6 Conclusions	37
5. Household survey	39
5.1 Introduction	39
5.2 Sample characteristics	39
5.3 Land use	40
5.4 Income and costs	42
5.5 Government and community services	43
5.6 Fire and peat-land management	44
6. Choice experiment	49
6.1 Introduction	49
6.2 Case study	49
6.3 Analysis	51
6.4 Economic valuation	54
6.5 Conclusion	56

7. Conclusions and recommendations	59
7.1 General lessons learned	59
7.2 Recommendations	62
References	65
Appendix I. Questions for Focus groups	67
Appendix II. Household questionnaire	69
Appendix III. Regulations	83

## Acknowledgements

This report is the final product of a close collaboration with the Central Kalimantan Peatlands Project (CKPP), involving CARE International Indonesia, WWF-Indonesia, BOS – Mawas, the office of Central Kalimantan of WWF Indonesia, the University Palangka Raya and Wetlands International. The project is financed by the Dutch government.

The authors of this report would like to thank all project partners for their cooperation in the workshop, and the development, translation and implementation of the survey. Our special word of thanks goes out to Palangka Raya University team: Dr. Ir. Aswin Usup, Drs. Tampung N. Saman, and the UNPAR Staff. We also thank Marcel Silvius of Wetlands International Headquarters in the Netherlands for his support.



## Abstract

Peatlands are the most efficient terrestrial ecosystems in storing carbon on earth. Approximately 50% of worlds' total tropical peatlands are located in Central Kalimantan. Peatland degradation, deforestation and fires cause these areas to contribute significantly to greenhouse gas emissions. International investors and development agencies recognise the potential cost efficiency of avoided further carbon emissions at relatively low costs. Such measures, however, cannot be effective without the full support of local communities.

The objective of the study is to estimate the socio-economic value of peatland resources in Central Kalimantan from the perspective of local communities. Several issues were studied such as the socio-economic situation of communities living in degraded peatlands, the attitudes on peatland conservation and restoration measures, and the compensation needed by local farmers to contribute to peatland restoration.

The study concluded that many local farmers find it difficult to make a living from the infertile peatlands, which are not very suitable for agriculture. They are therefore willing to switch to more sustainable practices such as reforesting part of their land, but only under the condition that their income levels do not decline.

Furthermore, the study makes a number of recommendations for peatland conservation measures to be effective, such as the need to create more awareness among local communities about the benefits of conservation, the need to create a system of secure tenure rights and reduce the risk of food and income shortages, as well as the opportunities for setting up compensation schemes in return for collaboration of the local farmers. NGOs proved to play a crucial role at present, although further coordination of their activities is required.





## 1. Introduction

Of all terrestrial ecosystems, peatlands are the most efficient in storing carbon. While covering only 3% of the world's land area, they contain as much carbon as all terrestrial biomass, twice as much as all global forest biomass, and about the same as can be found in the atmosphere. Peatlands store carbon for thousands of years. Peatlands also play critical role in biodiversity conservation and hydrological regulation (Wetlands International, 2007). More and more peatland is used for agriculture, commercial plantations and logging. This leads to conflicts about different uses of peatland, which often result in the satisfaction of interests of more influential or powerful stakeholders (Joosten & Clarke, 2002; Wetlands International, 2007).

Unsustainable management of peatlands might have severe consequences. Indonesia, which has approximately 50% of world's total tropical peatlands (ASEAN Appendix J, 2006), is responsible for the third highest emissions of CO<sub>2</sub> worldwide, mainly as a result of peatland degradation, deforestation and fires (Silvius & Diemont, 2007; Silvius et al., 2006; Hooijer et al, 2006; PEACE, 2007).

Because of the multiple functions that peatlands provide, the degradation of peatland ecosystems affects society at various levels. The impact on climate change and loss of biodiversity are the most obvious effects of peatland degradation to the global community. Degradation of peatlands and disturbance of their hydrological functions are threatening local communities in various ways. Health problems, income and property losses due to fires, smoke haze and floods, decreasing income from timber and non-timber forest products and fish add to the impoverishment of local communities.

In turn, the worsening socio-economic situation put even more pressure on natural resources by increased logging and forest conversion. Urgent solutions are needed that address social, economic, political and environmental components of this problem simultaneously. Re-establishing the hydrological balance, controlling fires, and supporting the recovery of native vegetation are seen as essential elements of peatland rehabilitation measures.

One of those, originating at the local level, is the economic dependence of local communities on the use of natural resources, especially logging or agriculture. Although agriculture is barely possible on natural peat soil, it is one of the major economic activities in the degraded peatland areas of Central Kalimantan. To be able to grow crops most farmers drain the peat, add fertilizers and practice slash and burn methods, all of which worsen the state of peatlands significantly. Yet, having limited alternative income generating possibilities, people remain heavily dependent on agriculture. Therefore, forbidding or otherwise stopping their common practices is impossible without offering alternative solutions (Silvius & Diemont, 2007).

Usually, solutions that take into account both environmental and socio-economic needs of local communities consists of two major elements: (1) creating alternative livelihoods and (2) creating mechanism that would ensure stable income or satisfy other needs. One of the most popular ideas is payment for environmental services (PES). In this scheme, people who bear costs by contributing to the conservation of ecological services enjoyed

by other member of the society receive some kind of (financial) compensation. The objective of PES is to increase income from sustainable activities and make them competitive with alternative, non-sustainable land uses.

The acceptance and support from local communities for such kind of schemes is essential. Any changes that could influence their current activities might be seen as a threat. Therefore, without appropriate communication of projects, community-involvement and ownership over planning, well-intended projects may lead to an increase in conflicts and failure at all levels (Silvius & Diemont, 2007). Exploring the needs and values of local people as well as understanding other factors that can influence their choice can be a good start.

### Research objective

**The objective of the study is to estimate the socio-economic value of peatland resources in Central Kalimantan from the perspective of local communities.**

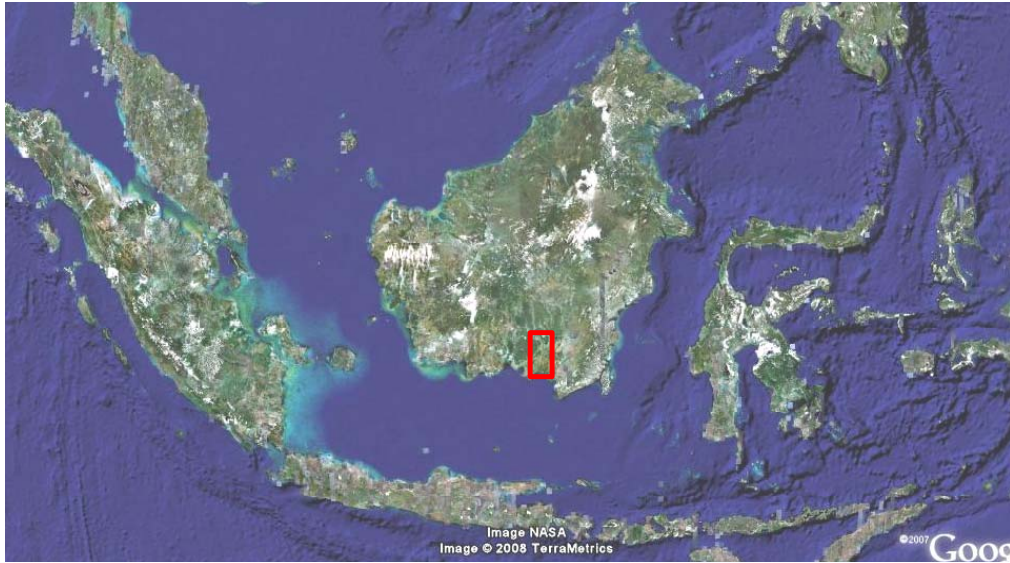
The fieldwork of this study addresses the following issues:

1. Identifying current *socio-economic situation* of communities living in degraded peatlands of Central Kalimantan.
2. Exploring the *attitudes* on peatland conservation and restoration measures, such as blocking canals, reforestation and the fire ban, and the factors that might influence these attitudes.
3. Estimating the *compensation*, both financial support and services, needed by local farmers to contribute to peatland restoration.

The results of this study are highly relevant to policy makers. First of all, the results can contribute to the design of policies and measures for peatland restoration and conservation that would be favoured by local communities. Collaboration and participation of local communities is a critical for the successful implementation of sustainable policies. Secondly, the results add information needed to attract financial donors that are considering participation in various schemes, by providing information about wider economic, social and ecological benefits of peatlands and comparing those to the needs and requirements of local communities as key stakeholders. This is especially important for Central Kalimantan, where peatland restoration and conservation might simultaneously contribute to poverty reduction as well as to increased environmental benefits such as reducing global greenhouse gas emissions.

### Description of the Study area

The field research was undertaken in the Southern part of Central Kalimantan, which is one of the most problematic areas in terms of peatland degradation in South-East Asia. The field activities take place Mega Rice Project (MRP) area, which is situated between Rivers Sebangau in the west, River Kahayan, River Kapuas and River Barito in the east and the Java Sea in the South.



*Figure 1.1 The study site – degraded area of Central Kalimantan, Indonesia.*

It is one of the few regions in the world, where unique and valuable tropical peatlands can be found. A peat layer of up to 20 meters deep mostly covers this area of more than 1 million hectares. Unfortunately, a large share of this peatland is severely degraded and only little of the peat swamp forest that used to cover most of the area remains. Nowadays, the degraded peatlands are used for agriculture, industrial plantations, and settlements or are left as wastelands. The area is continuously suffering from major fires and river floods. In combination with unfavourable agricultural conditions, these natural hazards contribute to levels of poverty that are 2 to 4 times higher than in the rest of Indonesia (Wetlands International, 2007).

One of the major causes for the degradation of this area was the Mega Rice Project (MRP). It was initiated by the Indonesian government in 1995, with the purpose of aiming to converting forest into rice fields. Approximately 4,600 km of drainage and irrigation canals were constructed in an area of 1 million ha. One of the reasons why the project failed was that peat soils are very different from mineral soils. Rather than irrigating the peat areas, the canals have led to systematic drainage of the peatland areas. The project failed and created enormous pressure on the local environment. The MRP project was abandoned in 1999 (Boehm & Siegert, 2001).

Although economic activities are limited, agriculture, fishing and some forestry activities are still taking place (Wiken et al, 2004), with agriculture being the most important source of income for the majority of local communities. As the rivers are important routes of access, there are some local shipping industries that supply the area with basic trade and other services. Other kind of economic activities, for instance tourism or local handicraft production are not well developed in Central Kalimantan. (Wiken et al, 2004)

Compared to other areas of Indonesia such as Java and Bali, Kalimantan is sparsely populated. Besides indigenous Dayak communities, there are communities of transmigrants from other islands or other areas of Kalimantan, who were resettled as a part of Indonesia transmigration programs or invited to help on the Mega Rice Project. Many of

these people remain in the area. Transmigration has resulted in additional pressure on limited natural resources and conflicts over land uses (Wösten, 2001).

### Structure of the report

This report is structured as follows. The next chapter describes the context of the research problem from ecological and socio-economic perspectives, based on a literature review. The methodology of this research project is outlined in Chapter 3. The following three chapters present the results of the field study and include a quantitative and qualitative analysis of the community perspective, as well as a choice experiment on peatland restoration measures. For the quantitative analysis a household survey, including the choice experiment, was used; focus group discussions along with key informant interviews provided data for qualitative analysis. The final part of the report discusses the results and outlines recommendations and final conclusions.

## **2. Context**

### **2.1 Introduction**

In this chapter, the context of the problem of peatland degradation is described by explaining the biological and ecological characteristics of peatlands, and the socio-economic and political issues that drive peatland degradation.

### **2.2 Chemical and biological characteristics of peatlands**

Tropical peatlands or peat swamp forests have developed primarily in the coastal low-land plains in-between major rivers (ASEAN, 2006). Technically, peat is partially decomposed organic matter that accumulates over thousands of years due to the lack of oxygen under waterlogged conditions. Tropical peatlands possess specific chemical characteristics. They are very acid and nutrient poor. Dry material of tropical peat consists of 50 to 60 percent carbon (Hooijer et al, 2006). Therefore, tropical peatlands store 2-6000 tons of carbon per hectare (t C/ha) compared to the average of 270 t C/ha on average in the world's forest ecosystems (ASEAN, 2007).

The peat soil in undisturbed circumstances consists of 80 to 90 percent water. The average water table depth in a natural peatland is near the soil surface. Water logging is a prerequisite for the creation and preservation of peat. These processes are highly sensitive to changes in hydrology and (micro-) climate (Wetlands International, 2007; Joosten, Clarke. 2002). Water, peat and specific vegetation are strongly interconnected. Therefore removing any one of these components or disturbing the balance between them may fundamentally change the nature of peatlands (Wetlands International, 2007).

Badly degraded peatlands are virtually useless for most purposes and very difficult, expensive and time-consuming to rehabilitate. When dry, peat hardly absorbs any water and can be easily eroded by rainfall or enflamed. Nowadays, there are large areas of repeatedly burnt unproductive peatland covered by grass or ferns which once held productive forest and provided many useful services ([www.peat-portal.net](http://www.peat-portal.net)).

### **2.3 Functions and values of peatlands**

#### **Functions and services of peatlands**

Peat swamp forests play a very important role in maintaining a wider regional ecosystem balance and critically support social and economic systems through the functions they provide. Table 2.1 presents an overview of the main peatland ecosystem values, categorized into direct uses, indirect uses and non-use values. These three types of values together form the Total Economic Value of a peatland. These values are the beneficial outcome of the hydrological, chemical and biological processes within the ecosystem.

Hydrological functions are especially important at the local scale. The peat, acting as a sponge, absorbs water during wet periods and releases it slowly during dry periods. Thus, intact peatlands have a very great potential to prevent loss of life and damage to infrastructure by reducing flooding downstream of the peatland, while the maintenance

of minimum flows in rivers in the dry season can support irrigation works downstream and prevent saline water intrusion up rivers (ASEAN, 2007; [www.ckpp.org](http://www.ckpp.org)).

*Table 2.1 Services and goods provided by peat swamps.*

Peatland Values	Examples
Direct use (Production functions)	<ul style="list-style-type: none"> <li>• Source of water</li> <li>• Recreation</li> <li>• Direct extractive use of biodiversity: <ul style="list-style-type: none"> <li>• food (e.g. fish)</li> <li>• medicinal plants</li> <li>• ornamental plants</li> <li>• aquarium fish</li> <li>• timber</li> </ul> </li> <li>• non-timber forest produce like rattan and other plants for construction purposes, fuel and handicrafts</li> </ul>
Indirect use (Regulation functions)	<ul style="list-style-type: none"> <li>• Storage and sequestration of carbon</li> <li>• Reduction of downstream flood peaks by absorbing floodwaters</li> <li>• Maintenance of base (minimum) flows in rivers by releasing water slowly during dry periods</li> <li>• Prevention of saline water intrusion by maintaining base flows and water table levels</li> </ul>
Non-use	<ul style="list-style-type: none"> <li>• Spiritual, historical and cultural values</li> <li>• Aesthetic values</li> <li>• Biodiversity attributes e.g. species richness and endemism</li> </ul>

Source: ASEAN, 2006.

Peat-swamp forests are characterised by a very high endemism. They are one of the most important remaining habitats for several rare and endangered species. The forests of Borneo are especially known as the last wild habitat of orangutans. The value of biodiversity is also important for medicine (ASEAN, 2006).

There is a number of studies on the economic value of various functions of peatlands. One cost-based study (Tacconi, 2003) estimated that the fires of 1997 cost around US\$4.5 billion through losses in various sectors like timber, tourism, transport, agriculture, in addition to actual costs of fighting the fires. There is also a good of example of application of the method based on estimating potential replacement costs to estimate the value of flood control function in Sri Lanka's peatlands. Another interesting example is as study of the economic value of peat-swamp forest services in Malaysia by Kumari (1995), which analysed various benefits of moving from an existing unsustainable timber management system to sustained forest management overall. The study concluded that adopting more sustainable methods of timber extraction from peat swamp forest was preferable in economic terms. Although shifting to a sustainable harvesting system reduced the net benefits of timber harvesting, the case study suggested that this was more than offset by increased non-market benefits, primarily hydrological and carbon storage values (Wetlands International, 2007). Finally, some experts suggest concentrating at the value of carbon that is captured and stored by peat swamp ecosystem. According to Buttler (2007) preserving forest and peat swamp that would otherwise be converted and

collecting the resulting recurrent revenue provided by the carbon offset market may be more lucrative for landowners in some areas than conversion to palm oil. With a carbon price range of US\$14 to US\$22 similar level profits may be derived over a period of 25 years (Silvius and Diemont, 2007).

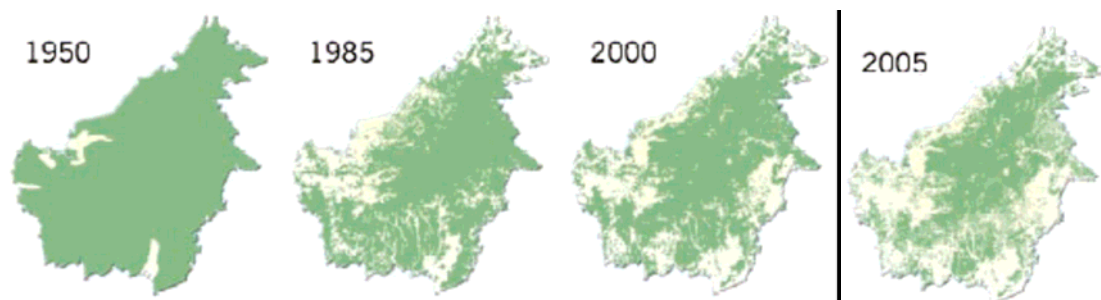
Many economic valuation studies try to compare various scenarios and usually come to the conclusion that the sustainable use of natural resources creates much more value than unsustainable use. Such results are often dependent on the inclusion of non-market ecological services, because in the long term the benefits of those are often high and sometimes more valuable than the marketed benefits (Joosten & Clarke, 2002). Benefits from the maintenance of peatlands as intact ecosystems may therefore exceed the economic returns of conversions of peatland for agriculture, forestry or mining by far. Yet in practise, such conversions continue because of a lack of awareness of the wider (non-market) economic, social, ecological and environmental benefits (Joosten & Clarke, 2002) as well as limitations to capturing financial benefits from conservation. However, considering the value of carbon storage in peatlands, for which markets do exist, might provide enough reason for conservation of this ecosystem as one of the best investments.

## **2.4 Direct causes of peat degradation**

The social, economic and political problems described in the previous section result in improper utilization and overexploitation of peatlands. The most evident threats in the region are: deforestation, drainage, and fires.

### **Deforestation**

Deforestation is one of the major problems in Indonesia, even in peat swamp forests that are supposedly protected. In Central Kalimantan, the average deforestation rate of peat swamp forests in 2005 was 5.42% (WWF, 2005). The change of the forest cover in Borneo from 1959 to 2005 can be seen in the Figure 2.1. Currently most of the area that this study focuses on is deforested.



Source: UNEP/GRID – Arendal, 2007.

*Figure 2.1 Extent of deforestation in Borneo 1950-2005.*

Deforestation disturbs the natural state of peat swamps, thereby increasing the risk of fires and causing high carbon dioxide emissions. The study of Langner and Siegert (2007) in Central Kalimantan showed that there is a strong correlation between distance from the forest edge and number of forest fires. In other words, more fires occur in or close to deforested areas, leading to even more deforestation of adjacent areas.



Deforestation is one of the main reasons of land cover and use change. Unsustainably logged areas often turn into unproductive fern and grass swamps. Some of these areas are exploited by local people to extract timber and non-timber forest products, other areas are converted into industrial plantations or simply abandoned (Wetlands International, 2007).

The direct causes of deforestation in Central Kalimantan are logging, clearing for agricultural purposes and plantations, and fires. According to the PEACE report (2007) many people participate in harvesting forest products in Indonesia either illegally or by abusing use permits.

### Drainage – development and use of canals

Disturbing the hydrological balance is one of the core threats to peatland ecosystems. When peat layers are exposed to oxygen, they start to decompose, dry out and become more susceptible to fires. This results in huge emissions of carbon dioxide. Excessive drainage can also cause a shrinkage or loss of wetland area, a reduction of water levels in adjacent wetlands and mineral soils and a decrease in water quality. Consequently, as peat subsides, the depth of the fertile topsoil also decreases. This means that further drainage, cultivation and pasture renewal are needed to maintain productivity, therefore increasing the cost to farmers (Wetlands International, 2007; Hooijer et al, 2006; ASEAN, 2006). Moreover, drainage increases the flood risk in wet periods, as the dry peat cannot take up the excess water.

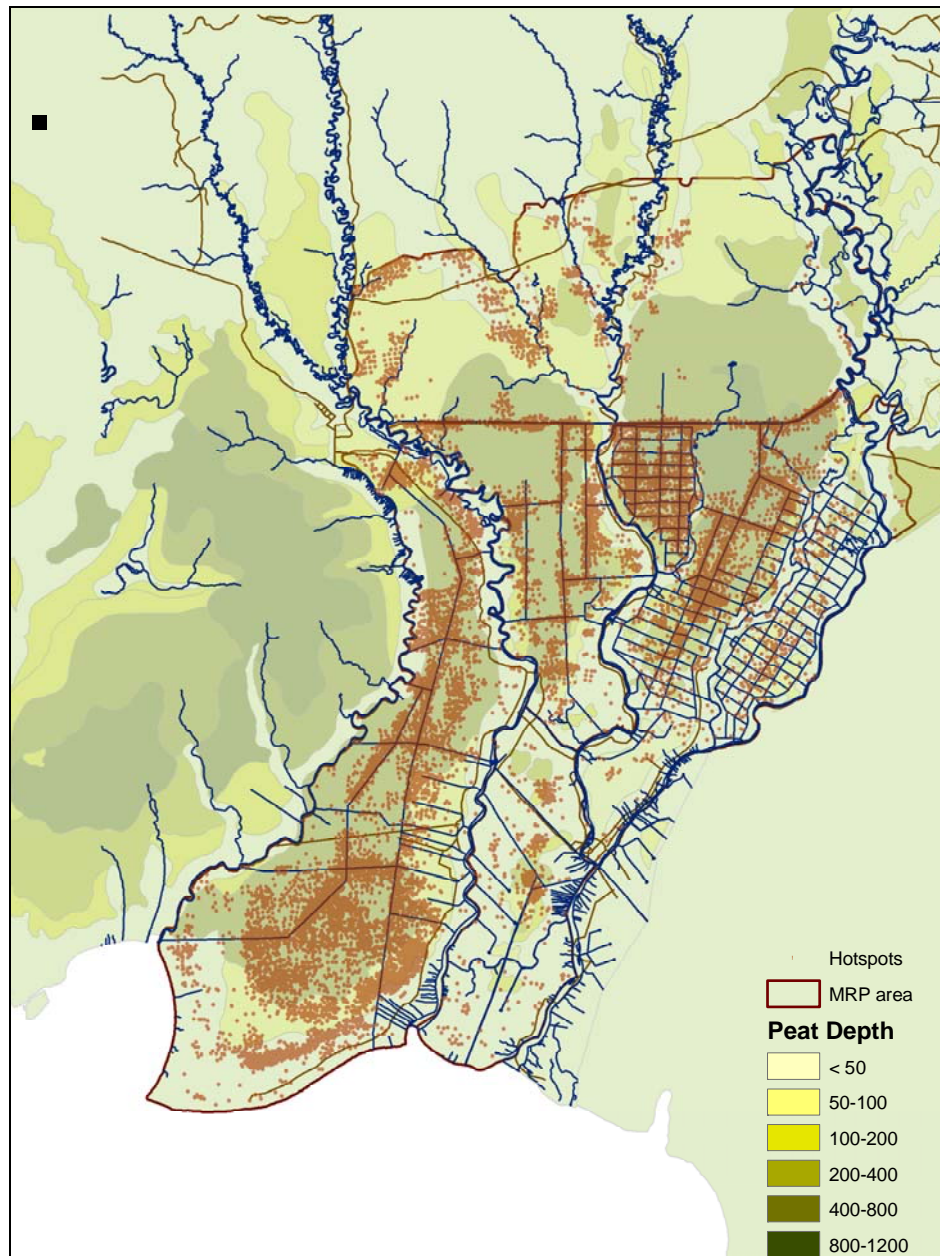
Almost every form of development of peatland involves drainage of the peatland itself and/or its surrounding area to some extent (ASEAN, 2007). For agriculture and infrastructure projects, drainage has been practiced for many years. Traditionally, farmers used to develop relatively small, closed ended canals. Many more canals appeared and continue to appear for logging activities, both to drain the land as well as to transport the logs. However, the majority of canals in the area appeared as part of the MRP in mid nineties. In total, 4600 km of canals were dug in Central Kalimantan in order to drain the peatland and prepare it for agriculture (Wösten, 2005). Even though the MRP was a failure, the canals remain in place until today, creating a major drainage problem in the region.

Nowadays, drainage canals still serve for agriculture, logging, fisheries and transportation both for people and goods (Page et al, 2002). Many of these canals are owned and operated by local villagers (CKPP web page). It is still a matter of debate whether some degree of drainage can be carried out which will avoid irreversible damage to the ecosystem. Meanwhile, canals still continue to be built, supported by the government as a result of conflicting objectives of economic development and conservation.

### Fires

Peat fires result in enormous emissions and further degradation of peatlands. The burnt areas and their surroundings become more susceptible to new fires and hence, the fire-affected areas expand from year to year. Fires that yearly re-occur in degraded areas of Central Kalimantan form a large threat to the remaining peatlands and peat swamp forests. Central Kalimantan is one of the places with the highest density of hotspots in Indonesia each year since 1997. Due to climate change the severity and occurrence of

droughts is predicted to increase in many peatland regions, which is likely to lead to an increase in carbon emissions due to fire. This may change many peatlands from being net sinks for atmospheric carbon into net sources (Wetlands International, 2007). Peat swamp forests under natural conditions are very resistant to fire due to a naturally high water table. Peat forests are only vulnerable to ground fires when water levels fall, which is commonly caused by logging, excessive drainage or severe droughts, all of which are currently present in the area (Wetlands International, 2007). Figure 2.2 illustrates the relation of fire occurrence in relation to drainage.



*Figure 2.2 Hotspots and drainage system in MRP area (depth in cm).*

People intentionally or unintentionally start most fires in Indonesia. Among the most of-ten cases are: slash-and-burn practices by smallholders, land preparation for plantations, and sometimes cigarettes (smokers). In Central Kalimantan, fire is traditionally used in

agriculture for many purposes - to clear the land (and at the same time show the ownership), to produce fertilizers and to increase the Ph level. Burning the top layer of the peat is the simplest and the cheapest way to fulfil these tasks (ASEAN, 2007). However the benefits from burning do not stay for long time due to leaching and erosion of the soil during rainy season. Uncontrolled use of fire can make the negative impacts of fires more dominant than the positive impacts (Joosten & Clarke, 2002).

## **2.5 Indirect causes of peatland degradation**

The reasons why peatlands are often converted for single sector uses, such as agriculture, forestry or mining even when not most beneficial in the long run, originate at various socio- and political-economical levels. The national political and institutional arrangements often fail to deal with these socio-political and economic drivers and induce unsustainable land-use practises.

### **Socio-economic factors**

The various use options of peatlands leads to conflicts. Some of the functions can only be performed by pristine ecosystem while others need modifications by humans. Some functions can be exploited infinitely when peatlands are sustainably managed, while other land-uses imply destroying the peatland or can only provide benefits for a limited period (Schumann & Joosten, 2006). Some groups wish to use peatlands for direct resource use, whereas other stakeholders wish to preserve and manage these ecosystems to derive benefits from peatlands' regulating and non-material life-support functions. These conflicts most often result in "win-lose" situations with the more influential or powerful stakeholders "winning" and the less powerful "losing" (Joosten & Clarke, 2002; Wetlands International, 2007).

Individuals often do not have incentives to maintain the services for the benefit of wider society. This has many reasons, starting off with market failures. For many extractive yet unsustainably produced goods, such as timber or agriculture, well-developed markets with high profits exist. The high profits stimulate deforestation and development of new plantations such as timber, pulp or oil palm. Many of these profits involve international trade and often the profits flows to other countries, whereas the losses of unsustainable production are most noticeable at the local level (Hooijer et al, 2006; Wetlands International, 2007; ASEAN, 2007). Furthermore, subsidies often distort markets and raise private benefits of land conversion. These subsidies encourage the drainage of peatlands for agriculture or infrastructure, including that for urban, industrial, and tourism development (Wetlands International, 2007).

Most services provided by peatlands are not marketed and do not generate income, but accrue to society at large. Furthermore, the negative effects of actions that cause degradation of these non-marketed services on third parties are often left uncompensated, since market mechanisms do not exist (nor, in many cases, could they exist). Also when significant investments are needed to restore the ecosystem functions, for instance the costs of flood prevention in down-stream areas, losses are often disregarded (Wetlands International, 2007; Silvius & Diemont, 2007).

As in many poor regions, economic development of the poor communities of Central Kalimantan is limited. The low average level of education, undeveloped infrastructure

and limited economic activities result in limited options for employment or other alternative sources of income for most of the peatland communities. Moreover, income generation from peatland products is often hampered by poor access to capital, poor market access, or domination of middlemen who capture most of the profits. These issues stimulate the choice of carrying out cheap land conversion, by burning, or collecting timber and non-timber products.

Socio-cultural factors that drive unsustainable use include the lack of environmental values, awareness, and poor understanding of the ecological complexity and importance of natural functions of peatland ecosystem ([www.worldbank.org](http://www.worldbank.org); ASEAN, 2007).

### **Institutional factors**

Among the institutional causes of degradation is the insecurity of property rights. Most of the local farmers, especially the Dayaks, do not have fully secured land tenure rights. The lack of legal protection of property rights or stewardship agreements adversely affects their income and stimulates unsustainable land use options ([www.worldbank.org](http://www.worldbank.org); PEACE, 2007; ASEAN, 2007). Threats to property security often come from more powerful agents at higher governmental levels that initiate timber concessions, conversion of forests to estate crops, transmigration projects and occupation of lands associated with the opening of forests for timber exploitation.

The MRP is a good example of such practises that disregarded customary community rights. Under the MRP, transmigrants from Java and Bali came to Central Kalimantan and were given a plot of land of 2.5 hectares of land, of which were designated for planting rice, and the other plot could be used for private cultivation. Transmigrants also got 2 years of life supporting subsidies to build up their new life. However, many transmigrants did not have knowledge and skills needed for profitable agriculture, and furthermore, growing rice on peatland with making a profit is hardly possible. This has induced illegal logging and a switch to crops like fruits and vegetables on small parts of the plots. There is a great need among farmers for continuous support and subsidies for pesticides, fertilizers and training.

The lack of a secure asset base also precludes access to traditional credit opportunities ([www.worldbank.org](http://www.worldbank.org)), which in turn reduce investments in more sustainable management options. The Dayaks on the other hand, traditionally practised slash and burn agriculture of crops that grow on peatlands, in combination with rubber planting on mineral soils on riverbeds. However, governmental subsidy programs usually do not support typical local peatland species and favour rice production. The lack of governmental support for indigenous communities compared to the benefits received by transmigrants has lead to social unrest and even violence.

### **National policy influences**

There are a number of national policies in Indonesia related to peatlands' and related resource management. However, these national policies currently fail to deal with the underlying causes mentioned above and thus cannot effectively prevent unsustainable uses of natural resources. In some cases national policies even support the appearance of various threats directly or indirectly.

In general, there is a lack of harmonisation of the policies related to the management of peatlands. Often, the responsibility for natural resource management is spread among a wide range of agencies, both at national and local levels. This fragmented management framework leads to conflicts, overlaps, duplications and omissions.

Effective implementation of these policies is another problem, which results from limited capacities and lack of enforcement. This became especially relevant after the issuance of the Law on Decentralization (UU No. 22 and 25/1999), which has devolved much of central government's authority and financial responsibility in the provincial and district management to the respective local governments without creating links between the central, regional, and local governments ([www.worldbank.org](http://www.worldbank.org)). In Central Kalimantan, failures in coordination between national institutions, the government of Central Kalimantan, the local Forestry Department, governments of the regencies and many other institutions are very common.

Illegal logging is often closely associated with manipulation, corruption and collusion involving timber tycoons, the local elite group, military, high ranking and local government officials. Some suggest that regional autonomy and decentralization apparently has worsened the destruction (PEACE, 2007).

According to The World Bank, "Indonesia's macroeconomic policies (tax and non-tax revenue policies and fiscal balancing formulas) appear to favour resource depletion over sustainable use as they reward district governments on resource revenue and not performance or stewardship, under-tax forestry and fisheries (relative to other natural resources), and do not allow charitable contributions by individuals or corporation". As a the result of the issuance of the Law on Decentralization, many permits have been issued that allowed forest extraction and land reallocation for large-scale agricultural plantations (oil palm, rubber and pulp), as they created great "cash" opportunities for local authorities ([www.worldbank.org](http://www.worldbank.org)).

Also at the local level, lack of empowerment is a problem that results in unclear village management by the head of the village. Research of Central Java villages by Dharmawan (2002) showed that the head of the village represents the higher level of government (district/sub-district) rather than his people, although they elected him. Moreover, the election process is not transparent and no rule requires a village head to be accountable to his citizens. (Dharmawan, 2002).

As already mentioned above, the ownership of most of the forest resources is unclear, which in many cases leads to overexploitation. All forests in Indonesia, whether on public or private lands, are subject to the jurisdiction of the Ministry of Forests (Colchester, 2004). The Department of Forestry classifies forests based on their production, conservation and protection functions. However, no further actions against overexploitation can be taken before the land ownership status is classified through land registration, which is very lengthy process. In 2005, the ownership of only 10% of land in Indonesia was clearly defined. Uncertainty of tenure for both the community and industry has contributed to land and forest degradation and, at times, violence (Contreras-Hermosilla, 2005). Official land rights go against the cultural laws and practises of Dayaks. For the majority of indigenous people sustainable use of forest is a traditional law and land tenure is just an issue of security, which is necessary for long-term commitments (Contreras-Hermosilla, 2005). Nevertheless, communities differ in their attitudes. Selling use rights

(once those were established) over forests to logging companies is quite a common phenomenon in Indonesia.

### National and international (N)GO activities

The problem of peatland degradation has only very recently started to attract the attention of broader (inter)national society. Currently, governmental and non-governmental organizations are largely involved in this issue, while financial support is coming from many public and private sectors. Worldwide organizations such as UNEP, Global Environmental Facility, the Global Environment Centre, WWF, and Wetlands International are working on peatland conservation issues. One of the best known initiatives in the field of peatland management is the project of the International Mire Conservation Group and the International Peat Society, who together with other partners, are promoting the wise use of peatlands since 1997. There is also a number of conventions related to peatlands' conservation, namely the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD), the Programme of Work on Inland Water Biodiversity, and the Ramsar convention on Wetlands. At a slightly lower international level the ASEAN (Association of Southeast Asian Nations) initiative started, through which a number of mechanisms to address peatland degradation and associated smoke haze is being established. One of those is the ASEAN Peatland Management Strategy 2006-2020 (APMS), which outlines 25 objectives in 13 focal areas to prevent peatland degradation and fires in the region.

At the national level the government, universities, research centres, and a set of NGOs, with the latter being most active, also address the problems of peatland degradation. Although current national political and economic structures hinder addressing the problem systematically and effectively, some positive changes can be observed in recent years, such as a tighter cooperation with national and international NGOs. The CKPP project is a good example of such a consortium. Also here, more coordination and communication is needed, as project partners often differ in their approaches to and perspectives on some problems. For example, some support rubber planting while others strongly oppose.

Up to now relatively few interventions have addressed the core of the problem of inappropriate and unsustainable land management. Most projects have addressed the symptoms such as controlling peatland fires, managing land subsidence and flood control, which result from peatland degradation. This is especially applicable to governmental initiatives (ASEAN, 2007). As the problems remain, root causes start to attract more and more attention.

The CKPP project tries to address both the causes as well as the symptoms of the problems in the MRP area. All of their activities are undertaken in close collaboration between the CKPP partners and local communities.

Their main interventions in addressing the direct threats to peatland ecosystem include:

- Fire fighting
- Hydrological restoration
- Reforestation of degraded peat swamp forest areas

Most noticeable interventions addressing the root causes are:

- Getting support and raising awareness among local communities,
- Awareness and training in alternative income generation
- Assisting the community planning procedures
- Community empowerment
- Developing partnership with between governmental organizations and NGOs
- Intermediating between local communities and donors in planning and implementation stages.

## 2.6 Capturing economic benefits of peatlands

International donors finance many of previously mentioned interventions. Their attention is increasingly growing as peatland restoration and conservation measures are recognised as major opportunities to reduce current global greenhouse gas emissions (Silvius, 2006; Hooijer et al. 2006) and at the same time bring large socio-economic benefits. Some peatland conservation projects are interesting opportunities to take a pro-poor approach, in which consideration is given to the equitability of the development in terms of revenue sharing between investors and local stakeholders.

Several funding schemes exist that offer the possibility to generate financial income by “selling” ecosystem services that otherwise could not be marketed, and thereby generate income to support sustainable conservation.

Among the best known systems and schemes are:

- *Carbon financing mechanisms:* Under Article 3.4 of the Kyoto Protocol, activities that enhance carbon sequestration in agricultural soils can be counted towards emission reduction targets, and can be traded on the international carbon market via the Protocol’s “flexibility mechanisms” (e.g. Clean Development Mechanism). Since a large proportion of peatlands are extensively grazed or under some form of agriculture, money from this source could be used to finance drain and gully blocking on a far larger scale than is currently possible.
- *Voluntary carbon market:* There are numerous private sector initiatives which indicate a strong interest in investment in avoided emissions through peatland rehabilitation and reforestation as a means to compensate for industrial emissions elsewhere. Voluntary markets are very suitable for the carbon projects of various scales, including micro project and projects unfeasible for EU ETC schemes. Moreover, there is a strong customer preference for the projects with additional benefits (Harris, 2006). According to Butler (2007) preserving tropical forest and peat swamp that would otherwise be converted and collecting the resulting recurrent revenue provided by the carbon offset market may be more lucrative for landowners in some areas than conversion to palm oil. With a carbon price range of US\$ 14 to US\$ 22.12 similar level profits may be derived over a period of 25 years.
- *Markets for (other) environmental services:* These markets are similar to voluntary carbon markets, but the object of “trade” is environmental services. An environmental service market is defined as a creation of an incentive system that provides the link between providers and beneficiaries of environmental services (Landell-Mills & Porras, 2002). The study based on the review of 84 studies related to the

marketing of environmental services in Indonesia revealed that the development of environmental services in Indonesia is still in its early stage although with increasing number of initiatives (Suyanto et al, 2005).

- *Payment for Reduced Emissions from Deforestation and Degradation (REDD)*: REDD is a newly emerging funding scheme, which is developed by the World Bank. This scheme under the BioCarbon Fund may offer in the short term options for various pilot schemes, including the option of carbon fund payments to national and local governments which need to be based on a national baseline monitoring, and the option for payments to private and community stakeholders and beneficiaries for their “environmental services” (Silvius & Diemont, 2007).
- *Payment for environmental services (PES)*: The core idea of PES is that external beneficiaries make direct, contractual and conditional payments to local landholders and users in return for adopting practices that secure ecosystem conservation and restoration. There are some additional conditions that have to be fulfilled in preparation for implementing PES mechanisms. The first step is an assessment of the range of ecosystem services that flow from a particular area, and whom they benefit is needed. Secondly, the economic value of these benefits to the different groups of people needs to be estimated. Finally, a policy, subsidy, or market to capture this value and reward landowners for conserving the source of the ecosystem services has to be created.
- *Bio-rights*. Bio-rights provide a financial tool, as a contract between local communities and the global community, to provide income for the local people, and to conserve natural resources and biodiversity. The micro-credit level is linked to the opportunity costs of sustainable use and conservation of the natural resource base and biodiversity. As such, the Bio-rights approach removes the incentive for unsustainable development and allows the public value of key biodiversity wetland/peatland areas to be transferred over time to local stakeholders as a direct economic benefit. The incentive can be increased by allowing the credit itself also to be repaid through such services, enabling the development of community-based revolving funds for sustainable development. This turns environmental protection and biodiversity in developing regions into a development opportunity rather than being associated with the poverty trap. Differently from PES, the approach does not require economic valuation of biodiversity or the ecosystem services that are maintained (Silvius & Diemont, 2007; [www.bio-rights.com](http://www.bio-rights.com)).

The option for local communities to provide services to the emerging carbon market in terms of peat swamp forest conservation and restoration projects represents a major opportunity for linking climate change mitigation to poverty reduction (Wetlands International, 2007). However, the contribution to poverty reduction highly depends on how the funding is used and how much of it can be channelled to local stakeholders. The latter two mechanisms operate on a lower, local scale. PES and Bio-rights differ from the other mechanisms because they link investments and ecosystem support activities provided by local communities.



## 2.7 Recommendations for sustainable peatland management

Although the number of successful projects for the sustainable management of peatlands is still limited, various authors and organizations propose the following recommendations:

- *Promoted an integrated approach:* In general, the single sector approach should be substituted by integrated, holistic planning strategies, involving all stakeholders to ensure that consideration is given to potential impacts on the ecosystem as a whole (Wetlands International, 2007). Land-use planning in peatlands should take account of the hydrological vulnerability of peatlands and the ecological relationships with the surrounding habitats and land-uses.
- *Critically review peatland laws and regulations:* Deep peat areas store most of CO<sub>2</sub> and could therefore be considered as most valuable in terms of climate regulation. However, although agriculture on deep peat areas is less intensive than in shallow peat areas, deep peat areas are not safe. Since ecosystems are interconnected, farming practices in shallow peat plots, like drainage, slash and burn or fertilizing are unavoidably affecting the surrounding deep peat zones. It is therefore recommended that the laws that strictly distinguish between above and below 3 meters deeps peatlands without mentioning any buffer zones should be reviewed.
- *Follow the precautionary principle:* In policy development, a precautionary approach should be applied to ensure long-term effectiveness. Large-scale developments in peatlands should be pursued only after considerable research and after successful completion of pilot projects (Joosten & Clarke, 2002; Wetlands International, 2007). Silvius and Diemont (2007) suggest it is very dangerous to start implementing immature ideas and projects, as those could lead to failures and disappointments and can discredit and endanger the new emerging sector, affect carbon price and create risks that so far have not been part and parcel of community- and government-based natural resource management planning. Projects also need to be developed with a long-term vision, including a strategy for the period after the donor has left. Local communities should have the need, capacity and resources to continue the project (Colchester, 2004). According to key informant interviews, better coordination and communication between organisations is needed to develop close cooperation and overcome differences in methods and attitudes towards effective policies.
- *Determine socio-economic optimal level of drainage:* With regard to the technical management, it is still a matter of debate whether some degree of drainage can be carried out that avoids irreversible damage to the ecosystem. Ideally water levels should be restored to natural ones. One of the ways to minimize the damage of agriculture is to choose species which require very little or no drainage. However, since currently water levels after drainage are often much lower than current crops require (ca. 0.4-0.8m), increasing the water level is possible in many areas without forcing farmers to change crops species. However, as Hooijer et al (2006) notice, water management and fire fighting have to go hand in hand as (1) peatland fires are nearly impossible to extinguish once they are established over large areas yet (2) the root cause of fires is the drying of peat through drainage.

- *Follow pro-poor approach:* Poverty reduction by providing alternative sustainable development options for peatland communities is seen as essential. Without poverty reduction local communities will increasingly be forced to over-exploit the remaining natural resources in peatlands, further worsening the problems of deforestation, drainage and fires and thereby increasing CO<sub>2</sub> emissions. It is therefore crucial that development, rehabilitation and conservation measures in peatlands will have a pro-poor approach (peat-co2), and that conservation policies include economic incentives for sustainable alternatives (Kahn, 2005).
- *Create enabling policy environment:* Economic development is only possible when the right political conditions are in place, including the political structures and legislation. In order to ensure that communities are empowered with decision-making abilities, it is critical that land tenure/rights of use be formalized. There is an urgent need to create an enabling policy environment for innovative mechanisms to provide the necessary legislative basis for long-term commitments from all stakeholders and management frameworks. (Wetlands International, 2007)
- *Generate local environmental awareness:* Many sources stress that social policies should accompany the physical or economic measures. Peatlands should be protected in a manner, which respects the positions of all stakeholders, contributing to sustainable life for humankind (Joosten & Clarke, 2002; Wetlands International, 2007). The majority of organizations sees increasing awareness, consultation and coordination with local communities as a necessity for successful conservation. For instance, if a restoration project can keep on building dams, but if local people keep removing them, consultation would be more effective.



### 3. Methodology

#### 3.1 Multidisciplinary approach

Valuation of peatlands is not a straightforward exercise. Markets for ecological services provided by peatlands are non-existent or poorly developed. It is therefore impossible to directly estimate the economic value of goods and services related to peatland forests. There are also social costs and benefits associated with peatlands and the services it provides, which are even more complicated to measure.

One of the alternative ways to estimate the value of the ecosystem is to find out the values that different stakeholders attach to it. In many cases this is a complicated task, requiring combining various approaches and methods. Therefore, the monetary estimates of peatland values are combined with a more qualitative exploration of values, attitudes and priorities.

As can be seen in Figure 3.1, both primary and secondary information was used for this report. Primary information was collected during the field study, applying both quantitative and qualitative research methods. For secondary information, scientific articles, reports and documentation of various organizations and projects were used.

The qualitative part of the study was set up to give a better insight in perceptions, attitudes and beliefs regarding peatland conservation and restoration measures. The focus was on three standard peatland restoration activities, namely blocking the canals, re-forestation, and the ban of fire. Regarding poverty alleviation, the attitudes on several development activities like trainings, compensation schemes, trust and participation were investigated. The group discussions offered the possibilities to explore the driving factors of these perceptions and attitudes.

The quantitative part of this study mainly consisted of a household survey, which was used for the analysis of the current socio-economic situation of communities living in degraded peatlands of Central Kalimantan. The Choice Experiment within the survey was used to quantify the compensation, both financial support and services, needed by local farmers to contribute to peatland restoration.

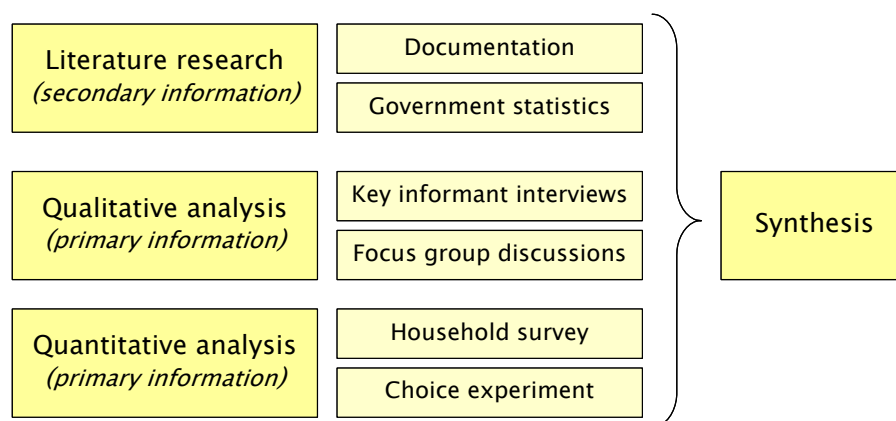


Figure 3.1 Structure of the methodology.

There are several reasons why both quantitative and qualitative research components are needed. Mixing quantitative and qualitative methods enables the researchers (a) to gain a better understanding of how respondents discuss and conceptualise the good valued; (b) to get aware of respondents' thought processes during the transaction and motivations for their responses and (c) also to test the adequacy of other valuation processes used (Powe et al, 2005). Combining methods helps to minimize the weaknesses of quantitative economic valuation methods, by giving insight in intrinsic values and add non-monetary values, addressing issues of income distribution and ability to pay.

### 3.2 Sample design

Twenty-one villages were approached to participate in this research. Twenty of them participated in quantitative research (questionnaire and choice experiment based survey) and fourteen of them in the qualitative focus group discussions. The latter were selected from the same list of villages where the household survey was conducted, because the two parts had to complement each other.

All sample villages were selected from degraded areas of Central Kalimantan, which were mainly located within Mega Rice Project area. This is also the area covered by Impress plans (the land-use development plans currently being prepared by the government of Central Kalimantan, which were mentioned in the questionnaire).

Literature and consultation with stakeholders indicated that the target group of the research are very heterogeneous. This implies that several factors should explicitly be taken into account as primary criteria for forming the sample. The criteria used in the final sampling design (see Table 3.1), are the following:

- *Ethnicity*: Some differences between these two groups like different level of knowledge about local environment or different farming practices were expected. The goal was to have a 1:1 ratio between villages inhabited by native (Dayak) communities and those populated by transmigrants from outside of Kalimantan<sup>1</sup>.
- *Depth of the peat*: This criterion was added to the selection for two reasons. Firstly, national or local legislation usually distinguishes between peatland with a peat layer of less than three meters and peatland with a peat layer of more than three meters. Sometimes, this distinction influences decisions, especially ones related to the land-use planning. Secondly, there is a significant difference of suitability for agricultural activities between deep peat and shallow peat soils. The ideal sample had to represent both groups equally. Nevertheless, in around half of the villages, which were pre-selected as deep peat ones, farmers also owned shallow peat plots, as the depth of peat can vary in small distance and especially in the areas close to the river banks<sup>2</sup>.

---

<sup>1</sup> Three transmigrant villages were of mixed origin and therefore an additional selection was made on-site to ensure, that 100% of respondents, who were in the transmigrant sample, were coming from outside of Kalimantan.

<sup>2</sup> Many villages are situated on the riverbanks where shallow peat and mineral soil (which are more suitable for agriculture) can be found. This made the sample not entirely proportionally equal.

- *Involvement into CKPP project:* This criteria was followed to test the possible effect of experience and knowledge resulting from the project activities on the perception of possible benefits of land use changes. In the final selection, half of the villages were those involved in CKPP activities and half were not<sup>3</sup>. The table below gives an overview of the selected villages and some of their characteristics.
- *Geographical location.* The application of this criterion, an even distribution of the villages (geographic position) over the research area, was limited due to the constraints of the project resources.

Table 3.1 Sample for quantitative research.

No.	Village	Ethnicity		Depth of peat		Involvement in CKPP	Focus Group discussion
		Dayak	Transmigrant	Deep	Low		
1	Sebangau Jaya		X	X		X	X
2	Paduran Mulya		X	X		X	X
3	Sebangau Permai		X	X		X	X
4	Tumbang Nusa	X		X		X	X
5	Gohong	X			X	X	X
6	Mantangai	X			X	X	X
7	Pulau Kaladan	X			X	X	
8	Sai Ahas	X			X	X	X
9	Batampang	X		X		X	
10	Teluk Betung	X		X		X	
11	Kalampangan		X	X			X
12	Dadahup		X		X		
13	Lamunti A1		X		X		X
14	Lamunti B1		X		X		
15	Sei Kapar	X		X			
16	Basarang Jaya		X		X		X
17	Pilang	X		X			X
18	Murung Keramat	X			X		X
19	Terusan Raya		X		X		X
20	Tampa		X	X			
21	Penda Ketapi	X			X		X

Out of 20 villages selected for the quantitative research, 10 were selected as a primary set for the focus group discussions (qualitative research). After those were completed,

<sup>3</sup> The proportion between samples of ethnic background within these two groups was not equal. From CKPP area just 3 transmigrant villages were chosen, because there were only 4 transmigrant villages situated in the deep peat in total. Moreover, they were all situated next to each other and shared some features in general. In the non-CKPP area the sample constituted of seven transmigrant villages, which allowed meeting the final 1:1 ratio between ethnic background villages.

another 4 were chosen (three within the sample of 20 and one from outside, as it corresponded to the criteria needed), making the final sample list of 14 villages.<sup>4</sup> There were 8 possible combinations of the 3 selection criteria (see table 3.2). In the selection of villages for focus group discussions, the aim was to select two villages for each of the combinations. In cases where there were no 2 villages with the same characteristics, other villages with similar characteristics were selected as long as the final 1:1 ratio for all criteria was met. According to the theory, even 2 groups per characteristic used to create homogenous groups may be enough (Fern, 2001), while in this research 7 groups represented each characteristic.

The respondents of the questionnaire as well as the participants of the focus group discussion were people living and farming on peatland in sample villages. The field study was conducted during the months of October and November of 2007, in Central Kalimantan (ex Mega Rice Project area) in cooperation and support of CKPP partners.

*Table 3.2 Selection of villages for focus group discussions.*

Combination	Characteristics*	Matching villages
I	DP TC CKPP	Sebangau Mulya, Paduran Mulya, Sebangau Permai
II	DP TC	Kalampangan
III	DP LC CKPP	Tumbang Nusa
IV	DP LC	Pilang, Penda Ketapi
V	LP TC CKPP	
VI	LP TC	Basarang, Terusan Raya, Lamunti
VII	LP LC CKPP	Gohong, Sei Ahas, Mantangai
VIII	LP LC	Murung Keramat

\* DP = deep peat; LP = low peat; TC = transmigrant community; LC = local community; CKPP = involved in CKPP.

### 3.3 Qualitative analysis

More recently, the role of qualitative methods has been extended to post-questionnaire exploratory and diagnostic tools. The results from post-questionnaire qualitative analyses have illustrated the wealth of information and understanding that can be gained, beyond that of conventional stated preference surveys (Fern, 2001). Focus group discussions and key informant interviews were chosen as the main techniques for the qualitative data collection.

<sup>4</sup> According to the theory, in some research projects the number of groups may not be predetermined. Firstly, discussions sometimes give a better idea of additional notions and constructs that need to be explored (Fern, 2001). Secondly, the number of groups depends on the rate of progress toward answering the research questions. This was the case in this research project, when the last four groups were chosen according to how well certain characteristics were represented in previous discussions, taking into account the quantity and quality of the discussions.

## Focus group discussions

Focus group discussions are commonly used for various social studies. According to Fern (2001), the focus group task of this research project can be classified as exploratory, as its main purpose was the identification and explanation of thoughts, feelings and behaviour.

It is generally acknowledged that focus groups should be composed of 8 people, give or take 2 (Fern, 2001). In the fieldwork, each group consisted of 5-15 participants. Therefore, no additional efforts were placed to exclude people that were invited by the head of the village out of respect towards the local culture. When the group is large (12 or more), it is more likely that members will focus on the information they have in common rather than on unique aspects of their backgrounds and experiences (Fern, 2001). The diversity of the number of participants therefore increased the probability that both individual and general issues were mentioned. In most cases discussions were taking place in the house of the head of the village; people usually sitting in the circle on the floor or on chairs in the way, that everybody would feel equal and free. This was a natural and acceptable way, advised to follow by locals. Focus group discussions lasted on average one to two hours.

Two moderators were responsible for managing the process. Two translators, originally coming from the research region, were involved in the process and also given the responsibility to adjust questions to the local language and understanding in general. They were consulted about the correctness, appropriateness and politeness of the questions that were being asked. Referring to the theory both setup and background characteristics of moderators are less critical for exploratory tasks than for other types of tasks (Fern, 2001). Nevertheless, limited knowledge of local languages was one of the limiting factors in getting full understanding of the local way of thinking.

Introductions into the discussion proved to be very important. Apart from the introduction of moderators, the research and thanking words for the participants, independency and confidence of the study had to be stressed. This helped to set up a suitable atmosphere, and avoid unnecessary worries or expectations. The introduction was followed by one of the open questions from the list. The list of questions was prepared prior to the discussion itself (Appendix I) but depending on the flow of each discussion some questions were skipped or added. Sometimes questions were formulated as conditions, which included various combinations of compensation, blocking the canals, use of fire and kind of species that people could grow and harvest in return to some changes. These types of questions often stimulated the discussion and revealed real priorities.

Reflective listening methods (non-judgemental, using paraphrasing and summarizing techniques) were essential due to continuously changing and scaling up amount of information, which had to be reconfirmed and classified and also aiming to avoid information loss due to possibly inaccurate translations. Nevertheless non-reflective listening (non-judgemental, with minimal responses) was quite often used for questions, which in local culture were considered more personal.

Limited knowledge of local languages, different flows of focus group discussions and the presence of the head of the village were three factors that could have the most influence on the quantity and in some cases even quality of information gained during the



discussions. The use of translators may have resulted in some data loss through the translation. Different flows of focus group discussions could have some influence on the context of certain questions that participants confronted. Natural flows of discussions were preferred, although some interventions were used to ensure that essential topics were covered. Another factor that could have affected the discussions was the presence of the head of the village or other representatives of the government in the discussion room. In many cases they tended to dominate in the discussion. Moreover they could possibly influence the answers of other participants, as many people appeared not to trust heads of the villages in certain issues (findings of the research). According to the local traditions it was not acceptable to exclude the representatives of the government from the discussion in general. Finally, interconnection of many issues could have had an influence both on the results and their interpretation, e.g. blocking canals and planting native tree species. Therefore, separation of the information had to be done very carefully.

### **Key informant interviews**

Key informant interviews was the main technique in revealing information from various organizations involved in peatland management issues in MRP area. “Qualitative interviews are conversations in which a researcher gently guides a conversation partner in an extended discussion. The researcher elicits depth and detail about the research topic by following up on answers given by the interviewee during the discussion. Unlike survey research, in which exactly the same questions are asked to each individual, in qualitative interviews each question is unique, as researchers match their questions to what each interviewee knows and is willing to share” (Rubin H., Rubin I., 2005). The main goal of the key informant interviews was to reveal additional data that could support secondary information from Internet, various not documented observations, and other findings from the field study.

Nine key informant interviews were held, two of which with representatives of local governmental organizations, and seven of NGO's, most of which were CKPP partners. Responsive interviewing techniques as described above were applied. This allowed for the adaptation of the interview to the relevant issues and the role of the interviewed stakeholder.

### **3.4 Quantitative analysis**

The qualitative part of this research project consisted of two parts: a household survey and a Choice Experiment (CE). The objective of the household was to describe and analyse the current land use practises and the perception on possible policy interventions. Furthermore, a good inventory of socio-economic data was needed. Both types of data can also be used to explain the results of the CE. The specific objective of the CE was to estimate the compensation needed to farmers to overcome possible losses due to new land-use policies. In the Central Kalimantan case, the main question was to what extend local communities would be willing to change their land-use and how much compensation they would need to reforest the CKP area and the ban on fire recently introduced by the Kalimantan Government.

## Questionnaire development

The questionnaire was developed in English and translated into Bahasa Indonesia. The questionnaire consisted of 54 questions divided over 5 parts. Almost all questions were closed-ended. The first included questions about current farming practices of the respondent, about land-use, soil type and crops. The next part asked questions regarding the involvement in development projects and subsidy programmes. Part 3 addressed the opinion on forest fire problems and some of the current restoration and fire prevention plans. It introduced the new Inpres #2 (without mentioning its name in the text) and asked respondents their opinion on the impacts of these plans. In this section, many questions had a statement-format; the respondents were asked to what extent he agreed with the statement. This approach has proven to work well in similar type of studies. The CE formed part 4 and will be explained in more detail in chapter 6. Questions about household data, such as age, education, household size, income, and profits and costs of agriculture formed the last part of the questionnaire.

Three rounds of pre-tests were organised in different type of villages to improve and finalize the survey questions and the show-cards that were used for the CE. The sampling strategy is described in the previous section. A further on-site selection was made to only include respondents who used peatland for agriculture or left their land unproductive, or used peatland for agriculture before the ban on fire was introduced. This was to ensure that local residents that were only involved in rubber planting were excluded from the survey. This group would most probably not be affected by the ban on fire and could not convert any agricultural land to forestland, and could therefore not contribute to the overhanging project objective, namely the conservation of peatland forests.

In the final survey, 8 interviewers conducted approximately 50 interviews in 20 villages. In total, almost 400 interviews were held with an average length of 45 minutes. The interviewers were experienced in conducting surveys and got additional training on choice experiments. Most of the interviewers were agricultural or sociology experts. They contributed to the development of the questionnaire to account for specific local characteristics.

## Choice experiment

The main objective of the CE component of this study was to do a bottom-up analysis of the compensation needed by local communities to reforest the CKP area and the ban on fire recently introduced by the Kalimantan Government. Choice experiments (CE) are a technique that was originally developed to model decision-making behaviour in marketing and transport research. It is based on so-called “random utility theory” and assumes that people make choices to maximise their utility. Besides to model (data on) actual behaviour, choice experiments can be used to analyse information from stated preferences, for instance from surveys in which people are asked to choose between hypothetical or future options.

In a choice experiment, respondents are asked to choose their most preferred alternative from two or more alternatives that are presented in a choice set. Usually, one of the alternatives is the status quo or business-as-usual option. These alternatives are described by a common group of so-called attributes, the components or characteristics of an alternative that are considered to be most important for decision-making. In economic

studies, one of the attributes is a monetary indicator, which makes it possible to calculate consumer surplus changes for different policy scenarios later on in the analysis. Each attribute has at least two distinct levels, which are varied systematically between the choice sets according to an underlying statistical experimental design.

In the analysis, which is based on statistical probability methods, the objective is to derive a utility function that explains the value of the different attributes in the choice experiment. The relative importance of the attributes compared to the monetary attribute gives the part-worth utilities of the attributes, the contribution of each attribute to the choices of the respondents. The final utility function can be used to calculate the welfare changes belonging to different policy scenarios that are described in terms of the attributes of the CE. The final selection of attributes and levels will be presented in Chapter 6.

### **3.5 Practical constraints and reliability of data**

Practical constraints, such as remoteness of villages combined with lack of infrastructure, as well as limited choice and flexibility of transportation, limited availability of enumerators (especially those, who operate both English and Bahasa Indonesia languages) may have also slightly influence the robustness of the results. To ensure good working conditions possible in given conditions, time schedules and practical arrangements were made in close consultation with enumerators. Nevertheless, in some cases the enumerators had to work for 5 days in a row, staying overnight at the houses of the heads of the villages. Two teams of enumerators, traveling separately also had supervisors, who were responsible for the revision of survey forms in order to track the mistakes or omissions, so that measures could be taken immediately.

Finally, after the data were entered into the database, one more review for irregularities was undertaken. One of typical problematic issues was the interpretation of the units in which the data were recorded (e.g. gasoline subsidies entered in bottles). In these cases enumerators or representatives of Palangkaraya University, who often work in the field, were approached for explanations and data were adjusted accordingly. However, the impact of these constraints was minor since it did not relate to more than 5% of the overall data.

## 4. Qualitative analysis

### 4.1 Introduction

The qualitative element of the research supplements the quantitative methods by adding more in-depth information about issues, such as drainage, use of fire, use of land for agricultural purposes and willingness to stop these practices. The results reveal people's values with respect to these practices, where they place priorities, how willing are they to change and what the underlying motivations are.

The analysis presented in this Chapter is based mainly on the information gained during focus group discussions with some inputs from key informant interviews and literature. The list of questions that were used for the discussion can be found in Appendix I.

### 4.2 Canal blocking

Canals appeared to be perceived as very important developments in a number of the villages. Farmers often use them for agricultural purposes, like drainage or irrigation. Canals are also used for transportation. However, there are also plenty of villages that claim not to use the canals at all. The matter of the MRP canals was an important issue addressed in the focus groups. The questions aimed at understanding whether and how these canals are currently used in farming practices and attempted to grasp the farmers' opinions about the option of blocking canals by building dams.

All villages but one responded positively to the idea of building dams in the canals surrounding their village. In many villages the MRP canals are used for draining and irrigation. In many cases where villagers were asked what they use the canals for, the answer was 'to reduce the acidity of the peat soil'. However, this is in fact a form of drainage, as in order to achieve low levels of acidity suitable for growing crops, the water tables need to be reduced severely. Keeping this in mind, drainage was mentioned in most cases by far as the main purpose the canals are used for today. During our focus group discussions, transport was only mentioned in three cases and thus does not seem essential to most villagers.

Transmigrant communities tend to make more use of the canals than local communities do. Only two local villages (Penda Ketapi and Gohong) indicated they actually use the canals, whereas Lamunti was the only transmigrant village that claimed not to use the canals within the surrounding area at all. This may be accounted for by the fact that local people's agricultural practices date back to long before the MRP was initiated, so long before the canals were dug. These villagers have been used to farming without the canals, so did not necessarily start using them once they were constructed. They may not even know actually how to use the canals to drain their land. The opposite would then be true for the transmigrant farmers. When they arrived in Central Kalimantan and first started their agricultural practices, the canals were already present, so they do not know better than to make use of them.

Even though most local communities indicated not to use the canals at all, in many cases their initial response when asked about blocking the canals was very negative, as was the

response in most transmigrant villages. They strongly opposed the idea of blocking canals by building dams. Out of the fourteen villages that were visited, only four responded positively to the issue of building dams. In two of these villages (Sei Ahas and Mantangai) Wetlands International had actually already been active in blocking the canals and the farmers were very positive about the results. This was not the case in the two remaining villages (Tumbang Nusa and Lamunti), here the farmers stated the peat was too dry to cultivate their crops successfully. In fact Tumbang Nusa is a CKPP village, which might contribute to the positive attitude towards dams, as villagers could have learned about dams during one of the other CKPP projects. And out of these four villages, three are local communities, which might be an explanatory factor, as they are capable of comparing the current situation with that before the canals were constructed. Fact still remains that the most villages by far initially responded negatively to the idea of building dams.

Fear of flooding the village was the main argument used against building dams. Villagers seemed certain that blocking the canals would cause heavy floods during the wet season. As a farmer in Terusan Mulya exclaimed: 'it would cause death and destruction!' A second reason for opposing dams was that it would be impossible to cultivate any crops on wet peatland. The soil would simply be too wet and too acidic to grow anything successfully.

An important explanation for such passionate reactions is a completely different perception of what building a dam actually entails. In their minds a dam means closing canals permanently, without any spillover system or sluice doors at all. This means excess water would have no place to go, inevitably flooding their villages. However after explaining the way Wetlands International constructs dams, securing safety from floods, most farmers quietened down immediately and were open to discussing the possibilities. Knowledge seemed a big factor in the willingness to accept dams, as ultimately the farmers' opinions took a large turn and ended up quite positive towards the idea. Such a change in opinion was most often caused by the thought that when dams with sluice doors would be constructed, farmers would be capable of controlling the water tables on their land, which would have a positive effect on their crops.

So even though villagers would be willing to have canals blocked in their areas, most probably they would still use the canals to drain their peatland in order to make it suitable for agriculture. However, this implies that water tables would be more stable than in the current situation, as the farmers would not allow the peat to get as dry as it often does nowadays during dry season. This improvement would contribute to reducing the risk of peat fires.

### **4.3 Use and ban of fire**

Uncontrolled fires are a large re-occurring problem in Central Kalimantan. Smoke causes health problems and serious damage to the environment, let alone the large emissions of greenhouse gases stored in the peat. The government of Central Kalimantan realizes these problems and, in an attempt to combat them, has issued a ban on fire in August 2007.

The ban implies that no one is allowed to use fire in their farming practices any longer. This has serious consequences for farmers in the region, as the use of fire is of great importance in local agriculture. It is used to clear new land of any trees or shrubbery before cultivating it for the first time, but also after the harvest to clear the plot of any remaining weeds or roots. Furthermore, fire is often used to generate ashes, applied as fertilizers on the crops. Prohibiting the use of fire means these practices would have to be altered drastically. In the focus group discussions several issues regarding the use of fire and the ban on fire were addressed.

### Fire experience and knowledge

Although the ban on fire was introduced because of yearly reoccurring large fires, the frequency of these fires appeared to differ in people's perception. In Gohong for instance a farmer's wife stated large fires occurred every year, burning many rubber trees. However the head of the village only mentioned 1996, 1997 and 2006 as years in which large fires had occurred. In Kalampangan the head of the farmers' union replied the last fire had been in 1976, even though the village is located in the middle of a fire hotspot area with large uncontrolled fires occurring every year. This particular village is surrounded by canals and wells, preventing the fire from entering the village itself. However large uncontrolled fires still are a problem in the area directly surrounding the village. So even though fires may well be a reoccurring threat to the region, not all villagers know about this or experience it as such.

Whatever frequency villages indicated for having to deal with fires, in all villages people were aware of the problems fires can cause. All participants unanimously answered affirmative to the question if the fires caused problems, independent of whether or not the villages were located in a hotspot area or not. The fires cause harm as they bring about health problems such as respiratory diseases. In a few cases damage to property was mentioned as a problem, but health issues were seen as the biggest threat.

Knowledge about the relationship between dry peat and peat was often limited. When addressing the cause of the fires many farmers responded by blaming smokers who throw away their cigarettes thoughtlessly or by blaming farmers in other villages who would not be capable of controlling their fire effectively. In only a few cases dry peat was mentioned as a cause of the fires spreading. Mantangai was the only village to blame the Mega Rice Project for the fires; according to the farmers there the project was the cause of the dry peat, which allowed the fires to spread.

### Attitudes towards the Ban on fire

Even though the ban on fire was issued August 2007, many villages openly indicated they still use fire, despite definite awareness of the ban. In total two thirds of all villages visited still use fire on their land, mainly for clearing the land and to generate ashes, used as fertilizers. There are no large distinctions between villages located on deep or low Peat, or between villages that are in the CKPP program and those that are not. However, ethnicity does seem to be of importance in the use of fire. Of the transmigrant villages, all but one (Paduran Mulya) still use fire. This proportion is quite different in the local villages, where only three out of seven villages indicated they still use fire. The other four clearly stated they do no longer use fire. Of these four villages there was only one

that indicated it had already stopped using fire long before the ban, so for them the ban had no impact. The other three villages clearly affirmed they had stopped using fire because of the ban, mainly because they were afraid of the penalties inflicted when getting caught. Most villages indicate they fear the penalties, but only for these three villages it has been reason enough to actually stop using fire. In most cases the farmers were afraid, but claimed they have no other option but to continue using fire. They have families to feed and do not know other ways of cultivating their land, or do not have enough money to shift to other ways of cultivation as these are more expensive than fire. In some cases local authorities even tolerate the use of fire, according to the farmers they understand farmers have no choice and no other way of feeding their families. Many villages have changed the way they use fire though. The farmers mentioned they control the fire now which means fires are only started in small areas at a time and have less chance of spreading.

Although plenty villages still use fire, the overall perception of the ban on fire is very negative. When asked directly 'how do you feel about the ban on fire?', only two villages gave a positive answer. Farmers in Sei Ahas and Murung Keramat believed the ban would have positive effects on their health and it would limit damage to property caused by fire. Some of the other villages also mentioned these positive matters that could be brought about by the ban, but they stressed the downsides of the ban. The most common sentiment heard was that even though the ban in itself is not a bad idea, prohibiting the use of fire creates large problems for which the government should offer some kind of solution. The farmers reckoned that when the government forbids the use of fire, it should also offer them an alternative or some kind of compensation. By prohibiting them from using fire they can no longer continue farming and would have no means of feeding their families. Since the government does not offer them any solution, alternative or compensation, they continue using fire on their land.

The positive attitude found in Murung Keramat and Sei Ahas can easily be explained from their own specific situation, in which they differ somewhat from other villages. In both villages the ban does not affect the farmers' lives directly. In Murung Keramat the farmers actually only used fire once, the very first time they cleared the land, which was quite a long time ago. They have not used fire ever since, which means the ban does not apply to them and does not influence their lives. Therefore, they are capable of focusing only on the positive side. Farmers in Sei Ahas on the other hand, indicated they did use fire before the ban and still do. They claim to use fire in a controlled manner ever since the ban, but nevertheless still continue to use it both to clear the land and to obtain ashes. What makes Sei Ahas different from many other villages is that the farmers clearly stated the police do not ever visit their village to check whether they use fire or not. It was one of the only two villages to indicate they were not really afraid of the penalties linked to the ban. The farmers here were quite confident they would not get caught and could continue using fire the way they were used to.

A cause for the overall negative perception of the ban on fire is the fear that it will have huge consequences for the farmers' income. This fear is particularly present in the villages that have stopped using fire completely and are thus affected most by the ban. In all of these villages farmers claim to have lost a significant part of their income as a direct result of the ban. Numbers mentioned range from half up till 75% of the income that has decreased. In Tumbang Nusa a lady declared she had been living there for over

40 years, but never was their yield as bad as last year, because of the ban on fire. In Pilang the farmers revealed they had stopped planting rice altogether as they had no idea how to cultivate their crops without the use of fire. Farmers now went fishing to feed their families. In both villages many young people had moved away looking for other jobs, for instance on palm oil plantations. Even in villages that still use fire stories were told of incomes decreasing by half and young people moving to cities and other villages looking for work, as in Sebangau Jaya.

A limitation of the study was that the ban on fire was issued in August and the villages were visited in October. This 2 months period might have been too short to notice a decrease in income, let alone to assess the size of the losses. Secondly, even if the farmers were capable of discerning a decrease of income in such a short period, the time span would be little short for young people to have moved out of the village already. Only one lady in Gohong who had stopped using fire answered she could not yet say whether her income had decreased or not, she would have to wait until the harvest in March to see. There could be several reasons why villagers claim such a huge decrease of income. However, the general message is that they clearly do not believe the ban on fire could possibly have a positive effect on their financial situation and expect dramatic outcomes.

Even though a strongly negative opinion on the ban on fire prevails and many villages still use fire, this does not mean farmers are necessarily unwilling to stop using fire completely. Almost all villages that still use fire revealed that they would certainly be willing to stop using fire under certain conditions. The condition mentioned most was that the farmers would receive trainings in how to cultivate their land without the use of fire. Other conditions mentioned were for the farmers to have fertilizers and tools at their disposal. This indicates farmers in the villages visited are not necessarily opposed to change and are quite willing to adjust their practices, as long as it is not detrimental to them or their families.

#### **4.4 Land use and land use change**

Agriculture is the main source of food and income for the majority of local people and therefore abandoning agricultural practices without alternative solutions would imply severe socio-economic consequences. Focus group discussions helped to explain why people choose the way they use their, and to estimate the willingness to change the land use to the forest along with the conditions required for such change and the reasons for those requirements.

##### **Current land use**

The use of peat land in the research area varies from highly intensive agricultural use to abandoned wastelands. The species that people grow most often are rice and rubber. Approximately half of the farmers also grow vegetables and fruits. Rice and vegetables are often grown in between young rubber trees until the latter ones are mature enough to harvest. There are only two villages (Kalampangan and Tumbang Nusa), where nor rice nor rubber trees are grown.

Apart from the type of soil, which primarily predetermines the type of species that can grow there, several other factors influence the choice of species that people cultivate. People appeared to be growing just a few species According to studies from other



regions, many more species could be cultivated on peatlands, especially when drainage and fertilizers are applied. Several factors could influence the limited variety in crops:

- Familiarity with and knowledge about common species. For example, one of the reasons why rubber trees are widely spread are the promotion and supply of nursery-trees by various programs of the government and NGOs. Limited access to information about other species could be one of the major reasons why some species that could be cultivated on peatland were not found or even known in the area.
- Access to seeds and nurseries. Farmers often mentioned that they would like to receive seeds or nursery-trees as a part of compensations or loans.
- Access to markets. The locations of some villages might make access to markets difficult, or people might not be able to afford travelling over long distances.
- Importance of the species for own consumption. Since rice is the main component of every meal in Indonesia, this drives the motivation to grow rice. The willingness to be self sufficient in rice was mentioned as an extremely important requirement (in two cases).
- Availability and size of local markets for alternative crops. While for rubber trees there is a well-developed market with a good price, the market availability for gamam trees (one of the native tree species) is very limited. This was often used as an argument against growing native tree species.
- Frequency of harvest. In two groups people mentioned that the advantage of growing rice is that they can harvest twice per year, ensuring a more frequent source of income. The same applies for rubber trees. This was also an argument against switching to native tree species – people cannot afford waiting till those have grown to be harvested. Since gamam trees take a little shorter to grow until ready for harvesting, many groups were more positive towards switching to gamam trees.

Most people had never even considered growing native tree species like gamam, because they used to harvest those products in neighbouring forests without major restrictions. From other native tree species only pantung trees were grown for cultivation and only by one village (Kalampangan). This was the result of a governmental agroforestry program, for which half of the village planted pantung (20%) and rubber (80%) trees between the vegetables that people used to grow before.

Two main factors can be identified that significantly influence current land-use and willingness to change land-use along with the required conditions. These were (a) the type of land (including the depth of peat) and (b) the size of the plot that farmers owned. People who also owned land on mineral soil or mixed soil (very shallow peat) appeared to be using their deeper peat plots less intensively (eight from nine cases). Farmers who had deep peat or shallow peat plots with high water levels often complained not being able to grow any crops due to low productivity of their land. In the two villages that did not use peatland to grow rice and rubber, people owned just deep peat (one of them had half on mineral soil). Very shallow peat (up to 1 meter) appeared to be used most intensively. Rice, vegetables and fruits usually grow there, while in deep peat zones people grow just rubber trees. However, people with just one hectare of land try to clear (even from gamam trees) and use their entire plot for agricultural purposes, especially to grow rice, “to satisfy their own needs”, while owners of larger plots tend to have more diverse land uses and grow a variety of crops.

## Land use change

In general, people appeared to be willing to consider changing their land-use. Nevertheless, they have two major requirements and considering their preferences could help inducing land-use changes. During the discussions, one of the objectives was to find the negotiation point at which the group would accept a 'deal' to switch to planting trees. These points differed between villages in terms of the terms and conditions they required.

First of all, the changes have to be beneficial to the farmers. Benefit is a relative term. In most cases groups conceptualized benefit as profitability. Non-monetary benefits were mentioned less often. For example decreasing the risk of fire can be seen as a benefit in the villages, which continuously suffer from fires and are often blamed for causing them. Restoring the natural environment was never spontaneously mentioned as a benefit during the discussions.

The second major requirement is to guarantee stable and continuous food and income supply. All the groups were concerned about this issue and were carefully exploring how the changes would influence both their short and long-term income. They did not accept to run the risk of not having income at some moment in time. Being allowed to keep half the land for agriculture made a significant difference in the willingness to change to planting trees on the other half, except in those villages where people also had mineral soil. Keeping the part of the land for agriculture minimizes the risk of not having income and food. Five VILLAGES explained that rice is the main food and it is important to be self-sufficient. Therefore, it is cannot be replaced by anything else. Some communities also wanted to keep other crops, especially vegetables, at least until the trees would be mature. In most cases people were willing to make agreements on changing land-use for the unused parts of their lands. However, some villages refused to plant trees even on unused land, explaining that it might be used later. As an alternative to keeping the part of the land for agriculture or sometimes even as an additional condition, people wanted to grow vegetables or a native type of rice (that can grow on wet soil) in between of young trees.

The issue of land use change is closely related to canal blocking and use of fire. Canal blocking has the tightest relation, because prior to re-planting native tree species, natural water levels of peatlands must be restored aiming to create as natural environment as possible for those species. This explains, why some of the groups were more resistant to the idea of planting native tree species. They realised that re-wetening peat land in future forest areas might also affect the land they used for growing other crops or even housing. The possibility that the village could get flooded was often one of the major dangers that people perceived as the result of building a dam.

Additional worries or arguments against the idea of planting native trees were expressed:

- Doubt that crops can grow well on wet and acidic peat land in general.
- Doubt about the existence and size of the market for native tree species, especially compared to rubber trees. These doubts were expressed in approximately one third of the villages, although others did not mention it at all. It suggests that location and accessibility to the market could have an influence, and that just local markets are considered.

- Worries about being able to generate income continuously and especially till the time trees are mature enough to be harvested. In more than half of the discussions people referred to the fact that it takes very long for a native tree species to grow (from 8 to 20 years according to them), which was often a reason to ask for continuous compensations and additional conditions, like keeping part of their land for agricultural activities.
- Unwillingness to put efforts and inputs into growing local tree species (expressed in a quarter of the villages). As mentioned before, galam and some other species used to grow or were still growing in the neighbouring forests or even their own lands by themselves and were harvested without restrictions. The idea of putting additional resources in growing those species did not seem to be an attractive opportunity.

Reacting to the needs and preferences that had been expressed during the discussions proved to be successful strategy in bringing more resistant groups to the negotiating point where they would consider switching to planting trees. One group said that they would most probably agree to plant native tree species if a nursery of these trees would be provided along with the seeds for “wet rice” (under the condition that planting both was allowed). They expressed willingness to switch from their current rice species to “wet rice”, because the former did not grow well. This knowledge was used to formulate an attractive ‘deal’ with the required conditions for this village that initially refused the idea of planting trees even on the half of their land (because they wanted to keep it dry). Overall, there were no groups that were completely against the idea of planting native tree species on their land and with whom any kind of negotiation was impossible.

#### **4.5 Compensation and trust**

Although each village is unique and might have specific needs or preferences, several factors that could influence the willingness to cooperate on peatland restoration activities appeared to be important for all the communities. These are information and knowledge, compensations or financial schemes and trust<sup>5</sup>.

##### **Compensations and financial schemes**

Once basic requirement regarding land-use conditions are met, compensations and various financial schemes appeared to be a suitable measure to get support from people for peatland restoration activities or compensate losses due to policy changes. This was also confirmed when talking about concrete loan-grant scheme.

Money was not always the only form of compensation that people needed. Although majority of the villages wanted to get at least the part in cash, mechanical tools (like tractors) were mentioned in nearly half of the villages. However, some groups stressed it could be difficult to share these tools, as they would be needed at the same time. Fertilizers, seeds or nursery (for wet trees or rubber) and non-mechanical tools were also mentioned. People, for whom the use of fire was the most important issue, were more interested in getting substitutes for fire, such as fertilizers (to make the soil more fertile),

---

<sup>5</sup> Questions related to these issues could not always be asked directly and therefore there was no consistency in the form of questions and situations when those were asked. Examples of questions used can be seen in Appendix I.

chalk (to increase the Ph level), pesticides, and tools (including mechanical tools) to clear the land.

In most of the villages, a five yearlong loan-grant scheme was presented that was also offered in the choice experiment (see Chapter 6). According to this scheme households could receive a loan, which could be used for any purpose, under the condition to plant a certain amount of trees on their land. The loan would become a grant if the planted trees were still present on their land after five years. Otherwise the full amount would have to be returned together with the interest for five years (for more details see Appendix I). In the majority of villages participants showed interest in this kind of scheme, but usually suggested to prolong the scheme up to 10-15 year, motivating it by the fact that it takes much longer for trees to grow. One group suggested repeating the entire, while in two cases lifelong compensations were suggested.

Although farmers were generally positive about the scheme, they expressed their worry that the money would eventually not reach the farmers in practise. This is related to the topic of trust. However, none of the groups was really negative about the scheme. Other worries were related to the ability to fulfil the requirements of the scheme. Considering that hardly anything grows on peat, farmers were afraid that they would have to pay a large amount of money back without having actual income. For the same reason, the participants preferred to do community service during the entire period of the loan instead of paying interest at the end of the period, but only in case of failure (for more information see Appendix I). Arguments like enjoying working together, or that community service is beneficial for the community in any way were also mentioned.

Referring to the fact that most of the communities were interested in this scheme, it could be assumed that other similar, properly formulated schemes, which would respond to the needs and conditions of the communities, could be successfully applied in the area.

### Training, education and knowledge

In the majority of the discussions training in the villages was very welcome. People were willing to participate in various conservation-related training options, like fire fighting workshops. Once accepted as real opportunities, participants also showed interest in training in blocking the canals or planting native tree species. Nevertheless, people showed interest in gaining new knowledge though training, especially in agricultural practices.

The main motivation to attend trainings was the willingness to gain new skills, which might generate money or protect property. According to partner organizations of CKPP, being able to protect homes and fields from fire was the main reason for people to join fire-fighting training. Protection of remote areas without homes or crops was therefore usually problematic. In two villages dams had been built together with the community members after training them for such work. Participants of the discussion noted that they valued their new skills, because they could now be hired for similar work in other areas. This might hold for any other peat land conservation activity, including fire fighting, and tree planting. Other motivations to engage in training were a general enjoyment of spending time together and interest in new activities in the village.

Although being positive about training activities, focus group participants had several recommendations how to make them more successful. Trainings should be held in the villages of the participants and the trainings should provide the instruments and materials so that people would be able to put their gained knowledge in practice. Although the need for training in various areas was obvious, half of the groups could not mention any specific training they would be willing to get.

Focus group discussions revealed that many people in the villages were not familiar with many features of peat land and the ecological services it provides. Although many knew the cause of the decrease in water quality, hardly anyone knew that natural peat reduces flood risk by absorbing excess water. Understanding and awareness about the connection between their activities and the state of natural resources was missing. This might have been due to limited access to public information sources, but might also be stimulated by worries about having to abandon current practices.

### Trust in institutions, participation in planning and decision-making

Trust appeared to be the major issue concerning financial or material support. Questions about financial compensation or grant schemes were generally met with scepticism, due to distrust that (the full amount of) money would eventually reach people. The reason for these attitudes often appeared to be previous experience. Often, just half or less than a half of the amount of money from monthly allowances, financial schemes for agriculture or other activities would reach the target group, due to (a number of) middlemen. Also the head of the village, being the lowest institution of the government, is a middleman and was often mentioned as such. Both the villagers and other stakeholders stated that in most cases there are a number of middlemen (middle-institutions) on the way to the recipients where money disappears. Therefore, the preferred way of getting compensation was always directly (to the hands instead of through the head of the village).

Trust among community members was not perceived as a problem. Questions about equality between community members, different villages or ethnicities did not capture the attention of the discussing groups. This could imply that these were not considered to be important or problematic.

The opinion about intermediates varies. Out of five villages that were asked questions about the preference for a provider of compensation, just one group strongly preferred government while another village preferred NGOs. The group that preferred the government had no experience in working with NGOs. Their choice was motivated by the fact that government was an official body and therefore thought to be more trustful. The group that preferred working with NGOs thought that fewer middlemen would be involved in the chain, so there would be more chance to get money. This village was part of the CKPP project. In general the solution itself and not the provider appeared to be more important.

Although according to the experience of NGOs most of the communities were willing to cooperate with them on various projects, people first of all named government as the body responsible for solving their problems. The government was supposed to offer alternative solutions for to the problems caused by the fire ban, take care of fires, pay compensation and take care of communities and their environment in general.

People appeared to be quite ignorant when it came to involvement in governmental decision-making. Discussion participants did not seem to understand questions about trust or willingness to participate in interaction with governmental bodies outside the village. Apparently most people had never even considered the possibility of any kind of participation in planning or decision-making outside their own villages.

#### **4.6 Conclusions**

Agriculture is the main source of food and income for the majority of communities in the research area. Canals and fire are perceived as essential elements in agriculture, without which further cultivation is hardly possible. Any activity aimed at blocking canals or reducing the use of fire is at first regarded as a potential threat to the livelihoods of farming communities. However, farmers do not attach value to the canals or the use of fire per se, but rather to their functions of preparing and fertilizing land. These functions ensure stable food and income supply. The farmers seemed to be quite indifferent towards the methods of draining and fertilization. It might therefore be possible to stop the unsustainable practices of fire use and building canals if acceptable substitutes are offered to secure income. Other functions of canals and fire, such as land clearing and transportation might also require alternative solutions, although in most villages these issues were hardly ever mentioned.

Farmers are generally interested in developments that could be beneficial financially or otherwise. Most communities seemed to be willing to start negotiations about the change of their land use if they saw possible benefits. Security of stable food and income supply after the change is essential. Those communities, who are least dependent on agriculture on peatlands for their income, are most open to changing current crops. Willingness to change current land-use depends on the type and size of lands owned (with or without land tenure), with the ones owning deeper peat being more positive towards change. To stimulate farmers to switch to more sustainable crops, providing information, supplying nurseries or developing (access opportunities to) markets are useful methods as they influence the choice of crop species.

Generally, farmers are willing to change their unsustainable land use practices for the better, under the condition that compensation is provided, securing at least the current income/welfare levels of local communities. Under the same conditions, the majority of communities in the research area welcome loan-grant schemes. However, a lot needs to be done to overcome the wariness of local communities with regard to such formal arrangements. Farmers are very sceptical about any financial deals due to the lack of believe that the funds (and especially intended amount) would eventually reach them. It is not the compensation provider that is mistrusted but the intermediary that is suspected of corruption. Paying compensation directly to farmers is the preferred approach.

There is a big gap between what farmers perceive as necessary training and what is recommended from outside. Many NGOs promoted contextual trainings such as monitoring the environmental condition and ways to respond to different conditions. However, local communities themselves hardly ever mentioned these types of trainings as essential and desirable. Instead, farmers preferred trainings on fire fighting or planting and harvesting skills.

There was minimal or even absence of knowledge regarding the underlying causes and physical threats of the natural environment. It is therefore recommended to raise awareness about the features of peatlands and the ecological services they provide, as well as to explain the connection between human activities and the state of natural resources. This lack of knowledge among the majority of villages is a big obstacle in trying to get communities' support for various peatland conservation activities. Whenever information was provided during the focus group discussions, regarding the connection between the state of peatlands and the provision of goods and services on which those local communities depend, dramatic changes in attitudes of the participants were observed. It is therefore recommended to actively supply accurate and understandable information. Considering the relatively low level of education of the communities, it is unlikely that community members will ask for this type of information themselves.

Finally, the study did not find any differences in attitudes, motives and perceptions between communities of different ethnical background. This implies that uniform measures for different communities can still be effective.

## 5. Household survey

### 5.1 Introduction

As part of the household survey, 378 households have been interviewed. The sampling and interview procedure of the survey has been presented in Chapter 3. In this chapter, the results of the household survey are presented. After a description of the sample characteristics, the current economic situation and the attitudes and perception regarding agricultural policies will be presented.

### 5.2 Sample characteristics

The average household interviewed in the survey has 5 members, consisting of 1.1 member in the age category of 0 to 12 years, 1.3 members in the age category of 13 to 17 years, and 2.6 members in the age category of 18 years or more. The average age of the interviewed head of the household is 45 years (see Figure 5.1).

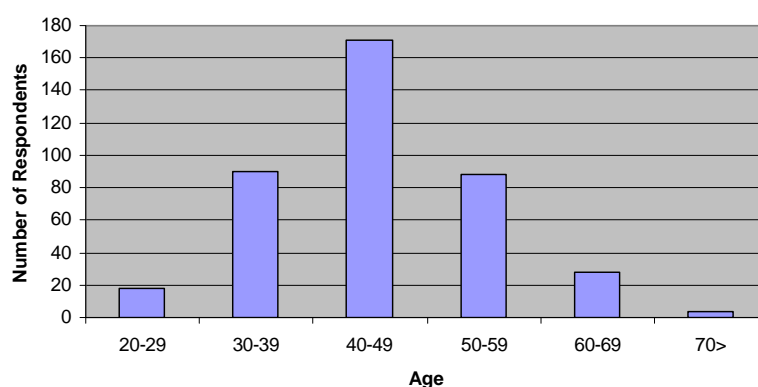


Figure 5.1 Age structure of the sample.

As shown in Table 5.1, the average level of education is more than basic for a poor region. Almost half of the respondents had some form of elementary education. These results reflect the developed educational system of Indonesia. It also gives confidence that most of the respondents were literate and able to understand the text and pictures used in the CE.

Table 5.1 Level of schooling of the respondent.

Type of schooling	Share
No formal schooling	5%
Elementary	49%
High school	41%
Vocational	5%
College or master's	1%

Around 60% of the respondents are born in Central Kalimantan, with another 4% from South Kalimantan. Over a third of the respondents were born in other Indonesian islands. Most of the transmigrants arrived with the Mega Rice Project in the mid nineties, or the



decade before. This also implies that their life support subsidies have stopped long ago. The average age of the respondents was around 45 years (see Figure 5.1).

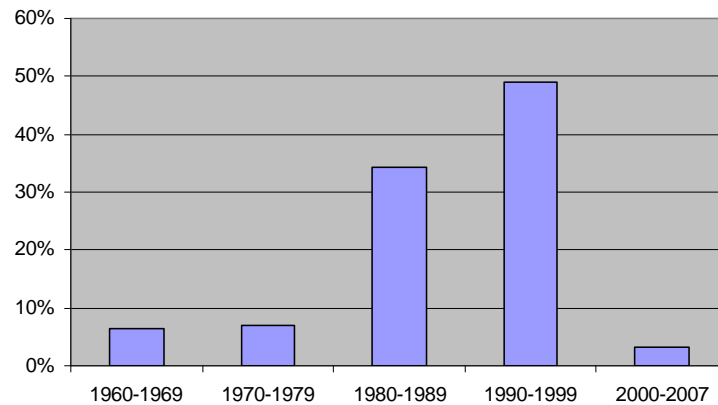


Figure 5.2 Year of arrival of the transmigrant respondent.

### 5.3 Land use

The majority of the interviewed households are landowners. Only 22% of the respondents are landless, 60% own all their land, and 18% part of their land. Since the main influx of transmigrants occurred in the nineties, on average, farmers cultivated their lands for 13 years.

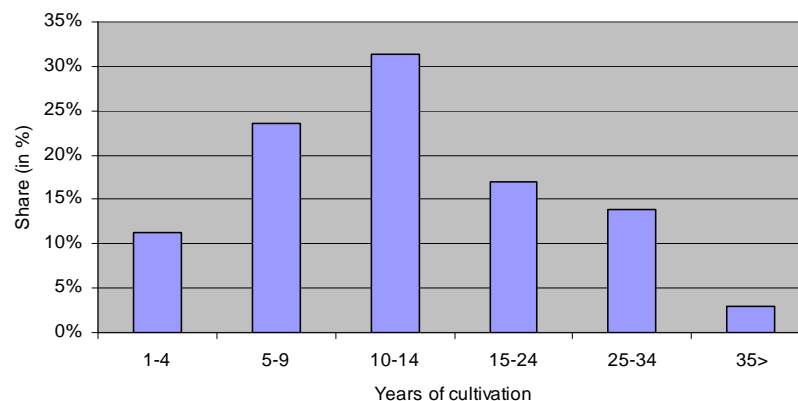


Figure 5.3 Number of years of cultivation of the land.

Table 5.2 show the distribution of the sample between plot size and soil type. The majority of the respondents use or own plots of 1 to 2 hectares. The average total land size 4.28 ha per household. Average total land size 4.28 ha per household (without outliers) Almost 90% of the farmers land is on shallow peat.

Table 5.2 Land-use pattern for different soil types.

	Deep peat	Shallow peat	Mineral soil	Total
0ha-1ha	20%	17%	24%	18%
1ha-2ha	43%	31%	68%	32%
2ha-5ha	28%	16%	8%	17%
5ha-10ha	6%	12%	0%	11%
10ha-15ha	2%	12%	0%	11%
15ha>	0%	12%	0%	10%
<b>Total</b>	<b>9%</b>	<b>89%</b>	<b>1%</b>	<b>100%</b>

Table 5.3 reports the type of cultivation practices by the respondents, subdivided by ethnicity. Since the Dayaks have a stronger tradition of shifting cultivation, the share of respondents using this technique is larger (23%) than in the transmigrant communities (2%). Besides tradition, another possible reason for immigrants to concentrate on permanent cultivation only is that they have been assigned a particular plot from through the Mega Rice Project, and therefore they have less freedom to cultivate other areas.

Table 5.3 Type of cultivation.

	Dayaks	Immigrants	Total
Permanent cultivation	77%	98%	85%
Shifting cultivation	18%	1%	12%
Shifting & permanent cultivation	5%	1%	3%

Figure 5.4 provides an overview of the average composition of the crops the respondents grow, by ethnicity. Rice plays a more important role for the Dayaks. Also growing trees (e.g. rubber) is more common among the native population of Central Kalimantan. Vegetables and fruits are significantly more popular among the transmigrant communities.

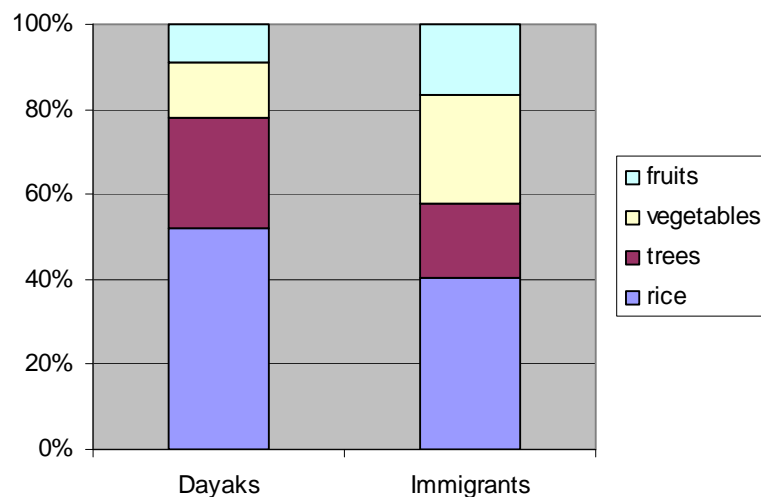


Figure 5.4 Type of crop.

## 5.4 Income and costs

The infertile soil of peatland requires farmers to use extensive fertiliser and pesticides to increase the productivity of the agricultural land. However, lack of funds makes it impossible for the majority of farmers to apply these supporting inputs. Only 45% and 48% of the respondents use fertiliser and pesticides, respectively. The average amount of fertiliser used amount to 126 kilogram per planning season. For pesticides this amount of only 5 kilogram per planning season. The annual costs of fertiliser add up to Rp 291,462 (US\$32) while pesticides cost on average Rp 216,765 (US\$24) per year.

Part of the incapability of farmers to purchase inputs like fertilisers and pesticides can be explained by looking at the cash income generated through the sale of harvested crops. Figure 5.5 shows that 56% of the sample is not in the position to sell any of their crops. These farmers are typically subsistence farmers who have barely enough food to feed their own households. When asked whether people can utilise their land in a profitable manner, 68% of the respondents replied in a positive way, while 31% of the respondents claim to make a loss with their agricultural practises.

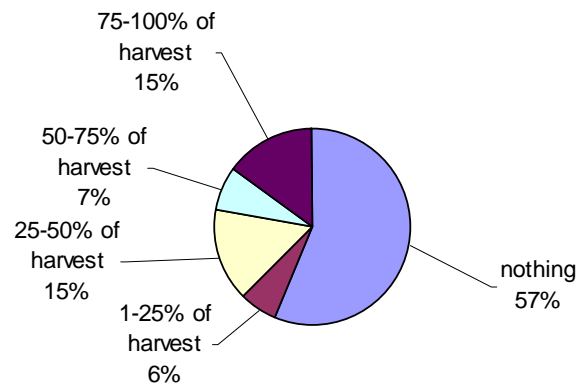


Figure 5.5 Share of the agricultural products sold.

As a source of income, agriculture forms only half of the total revenues (see Figure 5.6). Besides agricultural revenues, households try to supplement their income with other sources such as rubber trees, fisheries and paid labour. Also, around 15% of the respondents collect Non-Timber Forest Products (NTFPs) of which part is sold. By calculating the total income for different ethnic groups, Dayaks (Rp 8.2 million / US\$895 per household) turn out to earn more than transmigrants (Rp 7.3 million / US\$797 per household).

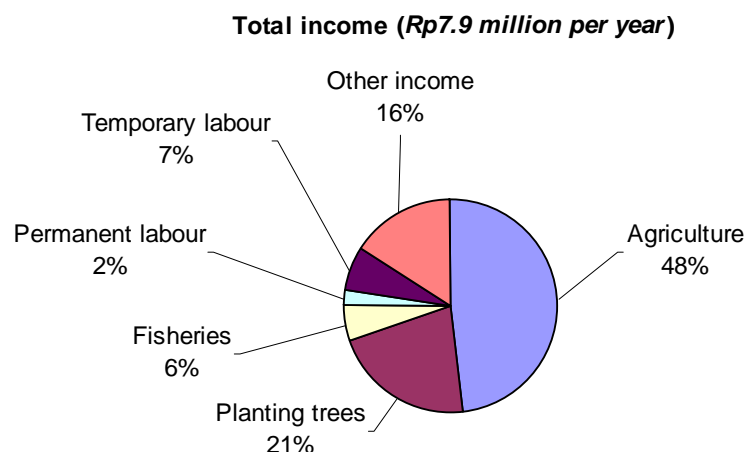


Figure 5.6 Average income composition.

The average annual income of was determined at Rp 7.9 million (US\$862) per household. It is important to realise, however, that the majority of the respondents earns between Rp.2 million (US\$218) to Rp.6 million (US\$655) per year (see Figure 5.7). This is why only 41% of the sample considers their income sufficient to sustain their family. The remaining 59% of the sample lacks of a number of amenities. Around 44% of the respondents lacks food to feed their families, 34% of the sample lacks funds to facilitate proper education for their children, 18% of the respondents has insufficient funds to maintain their housing, and 4% can not afford proper health care.

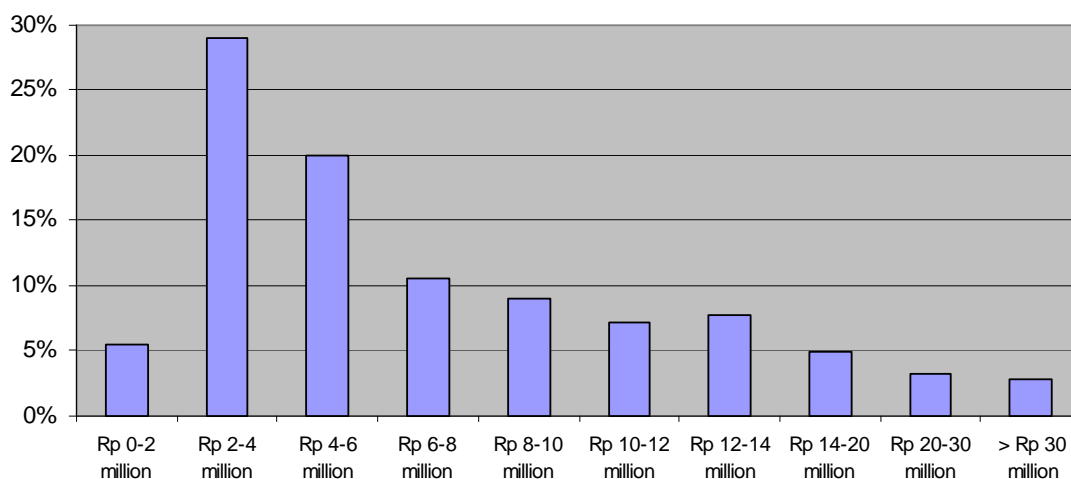


Figure 5.7 Distribution of income across sample.

## 5.5 Government and community services

Many of the transmigrants and some of the Dayaks communities received a government subsidy to motivate them to develop the area. The average subsidy received by the respondents was Rp 540,375 (US\$59) per household, ranging from as little as Rp 50,000 to Rp 1.5 million. Typically, the majority of the subsidies were provided recently. Apparently, the government is aware of the need to support this poverty struck region of

Central Kalimantan. There is an ethnic difference in the way the subsidies are allocated. Only 40% of the Dayaks claimed to have received support, while the majority (67%) of the transmigrant population received subsidies from the government.

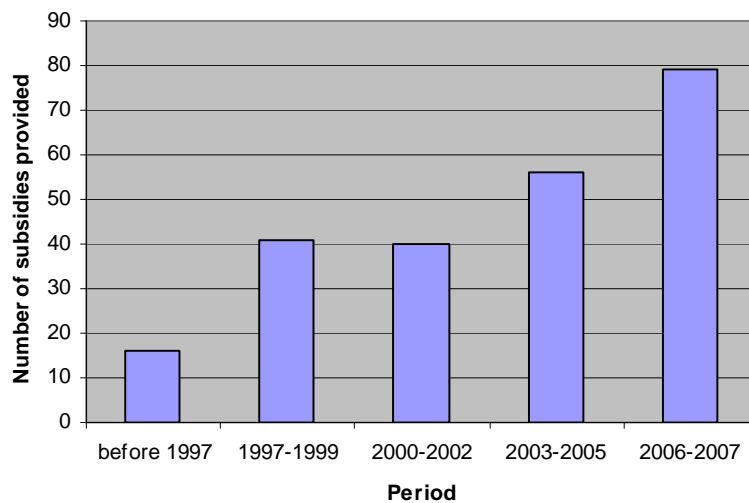


Figure 5.8 Timing of government subsidies provided.

A similar pattern can also be seen in the extension services provided to the communities. Slightly more than 40% of the Dayaks received support through extension services, while this share was much higher for the transmigrant population (80%). All respondents receiving extension services receive assistance in technology, pests and diseases problems. Training in micro-credit proposals is absent: only 2% of the respondents had received a micro-credit loan.

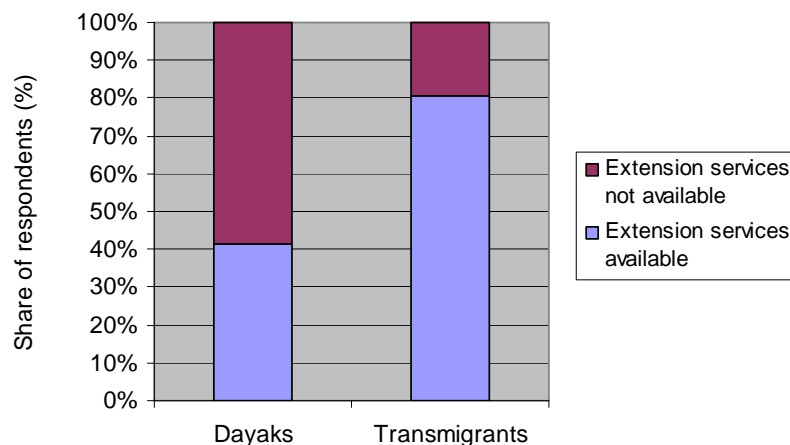


Figure 5.9 Availability of extension services.

## 5.6 Fire and peat-land management

When asked about the extent to which the respondents were impacted by the fires in the past, the majority (55%) of the respondents indicated to have suffered from fires in the past. The type of damage experienced was predominantly health related (67%) or referred to crop damage (29%). Also transport option caused economic damage to the communities (4%).

To reveal the perception with regard to the suspected causes of the fires, 39% of the respondents claimed it to be predominantly a natural phenomenon (see Table 5.4). Of the anthropogenic causes, farmers and smokers were equally responsible for causing the fires (28% each). The large plantations were not considered to be much of a cause.

Less than a third (28%) of the respondents are still using fire to clear and prepare their lands for agriculture. More than half (55%) of the respondents used to do this but claimed to have abandoned this technique of land preparation. Only 17% claims not to have practiced this technique at all. Note that the fire ban is formally announced via the new *Plan Inpres #2 2007*. Typically, only 31% of the respondents are familiar with this plan and realise that fire can no longer be used to clear or prepare their lands.

Table 5.4 Suspected main causes of fires.

Suspected cause	Dayaks	Transmigrants	Total
Nature	42%	34%	39%
Farmers	28%	29%	28%
Smokers	24%	34%	28%
Large scale plantations	0%	1%	1%
Other causes	3%	1%	2%
Don't know	3%	1%	2%

As shown in Figure 5.10, the majority of the respondents supported the fire ban (i.e. 61%). Some ethnic difference was recorder between the Dayak respondents (58%) and the transmigrant population (66%). Other measures that were positively perceived were fire prevention (99%) and reforestation (96%). Blocking canals is much less known to the respondents who therefore are less positive about this measure. Only 34% feel positive about blocking canals, while more than 40% feels negative about this measure. Also here, some ethnic differences are seen: 40% of the Dayaks support the concept of blocking canals, while only 24% is opposed this measure. For transmigrants, the opposite occurs: 28% favours, but 42% rejects blocking canals.

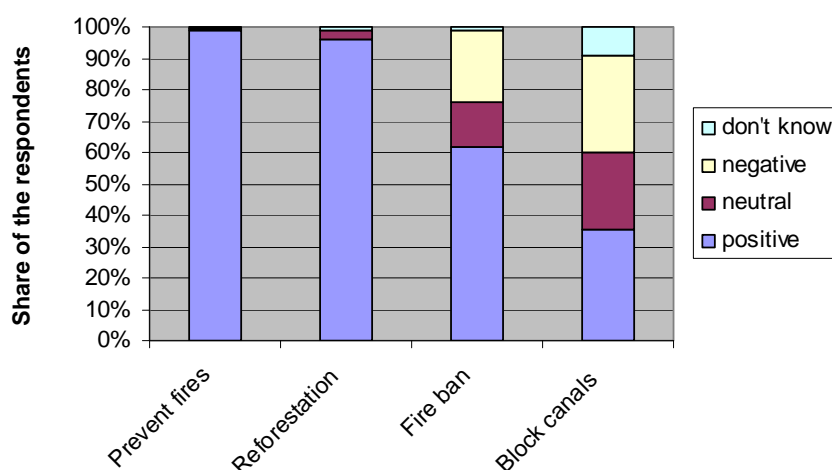


Figure 5.10 Perception of measures to reduce fire damage.

When asked about the need for compensation for lost benefits or higher costs caused by the fire ban, all respondents claim to be in need of some kind of compensation. Although money is the most preferred form of compensation, alternative reparations such as agricultural inputs and mechanical tools, are also popular. As can be seen in Figure 5.11 both ethnic groups respond to this question in a similar way.

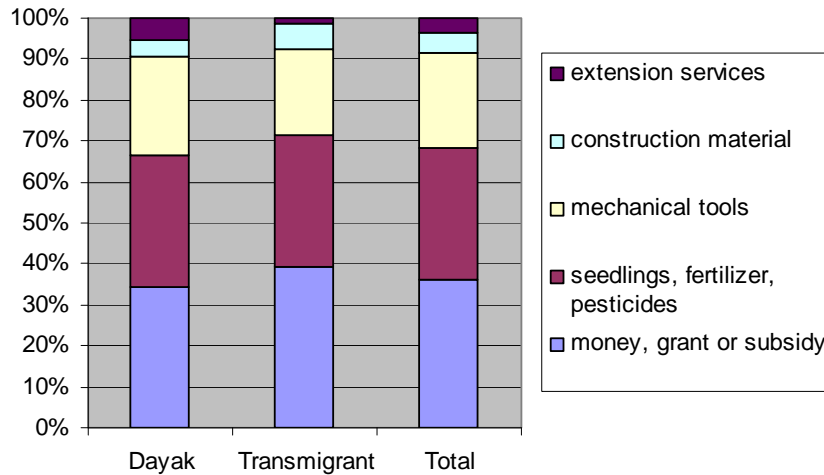


Figure 5.11 Type of compensation preferred by respondents.

The survey also presented the respondent with the option to abandon (part of) their agricultural activities and switch to reforestation and afforestation projects instead. As shown in Figure 5.12, one third of the respondents indicated to be willing to switch completely, especially since their current agricultural activities are far from profitable. Almost two third of the respondents were willing to switch partly to forestry activities. Only 3% refused to abandon their agricultural practices.

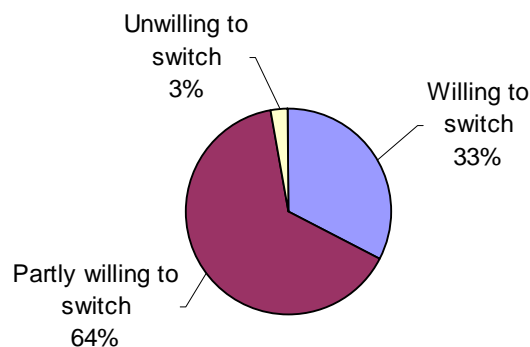


Figure 5.12 Willingness to switch from agriculture to planting trees.

As shown in Figure 5.13, the large majority of the respondents (99%) recognise the merit of peatland conservation. Therefore, people are generally quite positive about the fire ban and other measures taken to better manage the degraded peatlands. One condition for support, however, is that the government provides a proper compensation for the lost benefits of changing current practices. As noted earlier, blocking dams is not necessarily recognised as a positive measure. This is probably due to the fact that few people are aware of the benefits of dams for their communities.

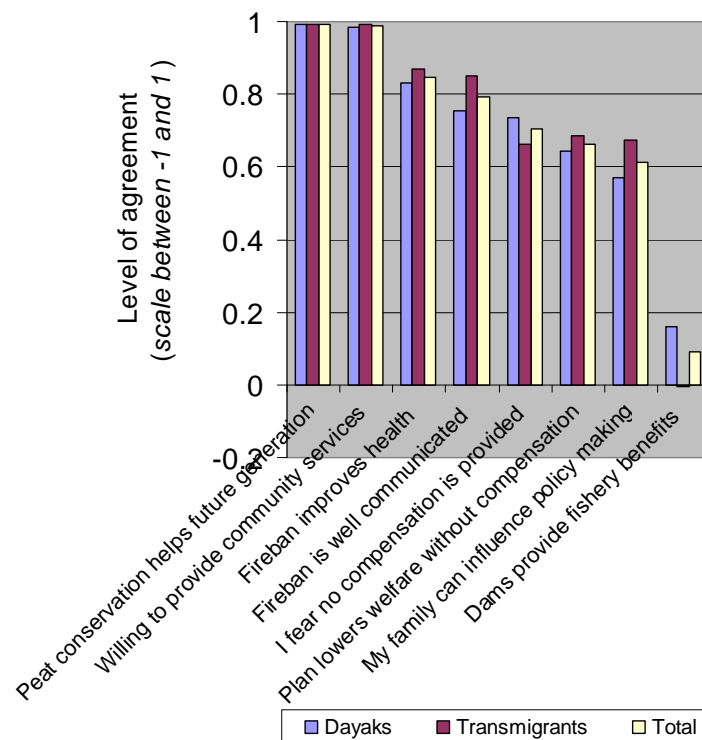


Figure 5.13 Perception of peat-land management.

Figure 5.13 also show that practically everybody is willing to contribute to peatland management by providing community services. When asked about their current involvement in such initiative, around three-quarters of the respondents indicate not to provide any community services. Not much difference exists in this respect between Dayaks (69%) and transmigrants (80%). Table 5.5 shows the type of community services that people are currently involved in. The services are very closely linked to the activities initiated by NGO operating in the region.

Table 5.5 Type of community services provided.

	Dayaks	Transmigrants	Total
Fire brigade	59%	97%	71%
Growing alternative crops	1%	0%	1%
Dam building	4%	0%	3%
Local plants nursery	30%	3%	22%
Other	4%	0%	3%





## 6. Choice experiment

### 6.1 Introduction

This chapter presents the development and results of the choice experiment (CE), which formed part of the household survey. The method has been explained in section 3.4. The sample characteristics are described in the previous chapter.

### 6.2 Case study

The set-up of a CE starts with the selection of the right attributes and their levels. For this study, a series of discussions and workshops on economic valuation with the local experts of the CKPP partners on forestation, agricultural economics and social development, and also pre-tests in the field were held to develop the list of attributes for the CE. Table 6.1 gives an overview of the final attributes and corresponding levels used in the choice experiment. These attributes and levels were chosen, because they describe the main characteristics of policy scenarios in the study area. By making various combinations of the attributes at different levels according to the underlying orthogonal design, different hypothetical policy scenarios can be presented to and evaluated by respondents. There is also a monetary attribute included, which allows the estimation of values in Rupiahs for the other attributes. Thereby it is also possible to calculate welfare changes that farmers will occur due to the implementation of various peatland policy measures.

The main objective of the CE study was to do a bottom-up analysis of the compensation needed by local communities to reforest the CKP area and the ban on fire recently introduced by the Kalimantan Government. Planting local tree species can be commercially viable as these species grow better on peatland than many other crop species, especially rice, but the output is expected to be lower than from agricultural crops. Reforestation can also be beneficial to local communities in terms of (non-)timber forest products, health and nature values associated with peatland forests. The ban on fire has both positive as well as negative effects in terms of welfare. On the negative side, the costs of clearing farmland increase if farmers cannot use fire, but the positive effects are that the danger of forest fires, including health problems and property loss, are reduced. To compensate for the increased costs of sustainable farming and changing current practices, farmers need financial assistance to change their planting habits and buy seeds and fertilizer, and to overcome the period needed for the trees to grow until they can be harvested. This financial assistance is designed as a micro-credit type of loan for five years, which would become a grant if farmers were successful in planting trees. Farmers could get a grant-loan based on the size of their land, so a per hectare sum. The grant-loan type of indicator also ensured that farmers would not demand compensation much above their income losses they might incur. The risk of highly overestimating the results of compensation needed is thereby reduced.

Since farmers do not have (much) experience in planting local trees on a commercial basis, they were expected to need training and assistance from extension officers. As the new policies would also have positive effects for farmers, they were asked to contribute to these policies by assisting in community services together with other community

members. This non-monetary type of contribution is often used in case studies in developing countries where local communities are unable to pay for certain services in terms of money, but willing to contribute in labour days. It should be noted that the choice experiment only addressed that part of their land that farmers were currently using for agriculture or had left unused. Farmers that only grow trees were excluded from participation. Hence, the results reflect compensation needed for changing the land-use of agricultural or wastelands only.

*Table 6.1 Attributes and levels in the CE.*

Attribute	Level
Forestation	25% forest land, 75% crop land 50% forest land, 20% crop land 75% forest land, 25% crop land 100% forest land
Ban on fire	No fire allowed Controlled fire allowed
Community services	0 days per planting season 2 days per planting season 4 days per planting season
Micro-credit	Rp 0 Rp 15.000.000 per hectare Rp 20.000.000 per hectare Rp 25.000.000 per hectare
Extension services	0 days 3 days per planting season 6 days per planting season

Before the actual survey, the interviewers, all working for one of the partners of the CKPP, were trained on the purpose of the study, the method, the sampling strategy, the protocol of the interview, and further explanation and assistance that could be given to respondents in case needed. In the field, each set was presented to the respondents on a separate card in a small binder. Each interviewer carried a binder with all 8 versions, which then were systematically rotated to ensure that each version was used an equal number of times. Before the actual choice experiment started, respondents were given an explanation about the attributes and experiment itself in text (in Bahasa Indonesia) accompanied by graphical illustrations to accommodate (semi-)illiterate respondents and facilitate the choices by visualization. One example choice card was included previous to the actual choice sets to practise the choice task (see Figure 6.1).

The choice sets for the study were composed using a fractional factorial design, which sets the levels of the attributes of the two alternatives in each set. The third option of each set was the status quo. In total, 8 versions were created each consisting of four choice sets: each respondent was only asked to make four choices (one version per respondent). From each set, they were asked to choose the alternative of their preference out of two options by trading off the attributes in the set. They could also choose to continue their current practices, in which case they would not be allowed to use fire, would

not receive any compensation or extension services and would not be required to participate in community services days. As the choice experiment was part of the larger household survey, respondents were asked their opinion on related issues regarding the ban on fire, their experience with micro-credits and loans, community activities and extension services before participating in the choice experiment. This information can be used in the analyses of the choices to explore differences among respondents.







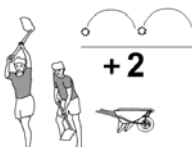
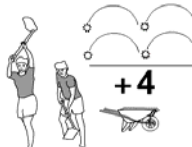
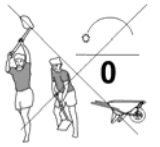






	Pilihan A	Pilihan B	Tidak ada perubahan
<b>Contoh</b> Alih tataguna lahan			
Penggunaan api	 Penyiapan lahan tanpa api	 Penyiapan lahan dengan api terkontrol	 Penyiapan lahan tanpa api
Gotong royong	 2 hari tambahan per musim tanam	 4 hari tambahan per musim tanam	 0 hari tambahan / musim tanam
Kredit usaha tani/kecil	 Rp 20,000,000 per hektar	 Rp 15,000,000 per hektar	 Tanpa kredit.
Layanan penyuluhan tambahan	 6 hari tambahan per musim tanam	 Tanpa layanan penyuluhan tambahan	 Tanpa layanan penyuluhan tambahan
Pilihan yang mana yang anda sukai	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 6.1 Example of a choice card.

### 6.3 Analysis

The total sample size was 400, with 20 respondents randomly selected from every village, as explained in Chapter 3. The results of the 400 interviews were coded in an Excel Worksheet and the analysis was performed using Limdep 8.0. The final model, a conditional logit model, was estimated using standard maximum likelihood procedures. In brief, a conditional logit model is used to analyse choices among alternatives as a function of the characteristics of the alternatives. Characteristics of the respondents can be added to the model. All attributes were effects coded. For the attribute forestation, a quadratic coded variable was also included to capture the non-linearity of this attribute.

The results of the final conditional model are presented in Table 6.2 and Table 6.3. Two models are presented: one attributes-only model and one model including significant interaction effects of respondents' characteristics. The parameter coefficients, standard errors and t-values are presented for each attribute in the choice experiment, and for those

interactions that are found to be significant. By making interactions between attributes and socio-demographic or perception related indicators, differences between respondents can be modelled. The coefficients represent the slope of the utility function associated with that attribute; the marginal utility per unit change in the attribute value. In other words, the coefficients indicate the weight or importance of each of the attribute variables in making a choice or on the underlying utilities of the choices.

As can be seen from Table 6.2, in the attributes-only model, all attributes except for extension services, are significant and their coefficients have the expected sign. The results can be interpreted as follows:

- When the controlled use of fire is allowed, an alternative is more likely to be chosen;
- When the number of days to be dedicated to community services increases, an alternative becomes less likely to be chosen;
- When the amount of the micro-credit is larger, an alternative is more likely to be chosen;
- When the number of extension days per planting season increases, respondents are less likely to choose that alternative.

Table 6.2 Model results without interactions.

Variable	Coefficient	St. error	t-value
ASC	34,633	1,222,560	0.000
Forestation (linear)	-0.1532***	0.0312	-4.887
Forestation (quadratic)	-0.4167***	0.0400	-10.417
Ban on fire (controlled fire = 1)	0.1280***	0.0418	3.062
Community services	-0.1100**	0.0511	-2.155
Micro-credit	0.1765***	0.0288	6.127
Extension services	-0.0031	0.0575	-0.053
Pseudo R <sup>2</sup>	0.4017		
Log likelihood <sup>6</sup>	-987,3819		N=1586

\* Significant at 0.10, \*\* Significant at 0.05, \*\*\* Significant at 0.01

For the forestation attribute, the interpretation is slightly more complicated. Taking the linear and quadratic effect together, the probability of choosing an alternative goes up when the forested area increases from 25% to 50%, but goes down for a change from 50%-75% and from 75%-100%. One explanation could be that respondents always want to keep a share of their land to cultivate for own consumption. Respondents might also want to spread the risk and use their land both for agriculture and for forestry. This result might therefore reflect the need for continuous income: while on one part of their land the new trees are growing and farmers are waiting for them to be harvested, on the other part income from agriculture can be generated.

<sup>6</sup> Likelihood-Ratio tests indicate that both models perform better than a constants only model, and the model with interactions performs better than the model without interactions.

Table 6.3 Model results with interactions.

Variable	Coefficient	St. error	t-value
ASC	34.6327	1222640	0.000
Forestation (linear)	-0.2377**	0.0450	-5.278
Forestation (quadratic)	-0.4262**	0.0404	-10.560
Ban on fire (controlled fire = 1)	0.1361**	0.0422	3.225
Community services	-0.1036**	0.0515	-2.011
Micro-credit	0.1041**	0.0471	2.497
Extension services	-0.2473**	0.0873	-2.831
<i>Interaction effects</i>			
Micro-credit * Money / grant / subsidy needed	0.1136**	0.0467	2.434
Extension services * income	0.1960 E-07**	0.0654 E-07	2.998
Extension services * shallow peat location	0.1770*	0.0943	1.878
Forestation * CKPP village	0.1620**	0.0622	2.605
Pseudo R <sup>2</sup>	0.4094		
Log likelihood	-974.6517		N=1586

\* Significant at 0.10, \*\* Significant at 0.05, \*\*\* Significant at 0.01

Refining the model by including interaction effects with socio-demographic and preference data reveals the following patterns, as can be seen in Table 6.3:

- Respondents who prefer money, grants or subsidies to compensate income losses resulting from the ban on fire<sup>7</sup>, have a higher preference for micro-credit attribute than others;
- The higher the respondent's income, the higher the preference for extra extension services;
- Respondents living in villages that are located in a mainly shallow peat area have a higher preference for extension services than respondents from villages in deep peat areas;
- Respondents from villages where the CKPP is organising activities are more positive towards reforestation of their lands than respondents from other villages.

The attribute of extension services needs some further discussion. The results of debriefing questions show that extension services were less needed than other types of compensation, like money, tools, or fertilizer. The attribute was also second-last mentioned as 'most important variable' for making a choice between alternatives – just before 'community services'. This result might be due to the fact that many of the respondents did have no or hardly any experience with extension services. However, indicators for experience did not turn out to be significant in the conditional logit model. In the interactions-model, the extension services attribute becomes significant after correcting for income and location effects. The average income in the sample was Rp 7.9 million per year per household. Multiplying this large number with the coefficient of the interaction tells us that the effect of this interaction is about 0.1165. In combination with the interaction between extension services and shallow peat locations, the effect of an increase in extension services can actually have a positive effect on consumer surplus. This implies

<sup>7</sup> Around 44% of the respondents list "money, grant or subsidies" as their most preferred type of compensation, 20% as second most needed.

that some heterogeneity based on income and village location exists amongst the respondents, which is not captured in the attributes-only model.

## 6.4 Economic valuation

One of the main objectives of the Choice Experiment was to calculate the economic value that local communities attach to changes in the attributes: reforestation area, the fire policy, community services and extension services. This information can be used to estimate the welfare changes that farmers will occur as a result of changes in peatland policies. The information of the CE can be used to calculate the relative utilities of the different attributes, or, in other words, how much of one attribute is needed to compensate for a loss in another attribute. Since one of the attributes (micro-credit) is a monetary indicator, the marginal willingness to accept a change in one of the non-monetary attributes can be calculated by estimating the sensitivity of the non-monetary attribute to the credit-attribute. The marginal rate of substitution between the non-monetary attributes and the monetary attribute reflects how much a change in one of the non-monetary attributes will have to be compensated by in money terms to keep the respondents at the same level of utility. This marginal rate of substitution is calculated by dividing the coefficient of the non-monetary attribute by the coefficient of the monetary attribute (the micro-credit), taking the coding of the variables into account. The calculations presented here are based on the model with interactions to account differences between respondents.

It is important to keep in mind with these calculations that the micro-credit is a one-time payment that turns into a grant after 5 years if the farmer has successfully planted local peatland tree species on his land. It is assumed that farmers will be successful in doing so and won't have to pay back the loan. This restriction on the monetary indicator however ensured that farmers would not ask for overly high compensations compared to the losses they might incur. Furthermore, the marginal rates of substitution are reflected in millions of Rp per hectares, because that is the unit of the micro-credit attribute.

The marginal rates of substitution are used to calculate the changes in consumer surplus that will result from changes in attribute levels. The following changes are calculated against a baseline of 25% forested area, a complete ban on fire, no community services, no compensation and no extension services. Furthermore, surpluses are calculated taken into account sample averages for income, for villages located on peatland, and for cooperation in the CKPP projects. Note that differences in the appreciation of monetary compensation versus other types of compensation in interaction with the micro-credit attribute are not included in the calculations.

Table 6.4 shows the marginal rates of substitution per change in attribute in million Rp / per hectare per household (each change *ceteris paribus*).

- A forestation change from 25 to 50% induces a gain of Rp 33 million per hectare per household in CS on average. This gain is slightly lower in non-CKPP villages with Rp 29 mln/ha/hh and higher in CKPP villages (Rp 37 mln/ha/hh);
- A forestation change from 25 to 75% induces a gain of Rp 26 mln/ha/hh in CS, with again differences between CKPP and non-CKPP villages;

- A forestation change from 25 to 100% induces a loss of Rp 23 mln/ha/hh in CS in the average sample. Losses are highest in non-CKPP villages with a perceived loss in CS of Rp 34 mln/ha/hh and smallest in CKPP villages at Rp 19 mln/ha/hh;
- Allowing farmers to use 'controlled' fire induces a gain of Rp 13 mln/ha/hh in CS;
- Asking people to participate in 2 days of community services per planting season costs Rp 5 mln/ha/hh in CS, so about Rp 2.5 mln/ha/hh per extra day in a planting season, and<sup>8</sup>;
- Providing 3 days of extra extension services per planting season is only beneficial in shallow peat villages and will generate Rp 4 mln/ha/hh in CS, so about Rp 2 mln/ha/hh per extra day in a planting season. In deep peat villages, extension services will not be beneficial.

*Table 6.4 Marginal rates of substitution per attribute (\* Rp 1 mln/hectare/household).*

	Sample average	No CKPP, deep peat	No CKPP, Shallow peat	CKPP, deep peat
50 % Forestation	-33.41	-29.52	-29.52	<b>-37.30</b>
75 % Forestation	-25.88	-18.10	-18.10	<b>-33.66</b>
100% Forestation	22.58	34.24	34.24	<b>18.69</b>
Controlled fire	-13.07	-13.07	-13.07	-13.07
2 Days community services	4.98	4.98	4.98	4.98
4 Days community services	9.95	9.95	9.95	9.95
3 Days extension services	0.26	4.51	<b>-3.99</b>	4.51
6 Days extension services	0.53	9.03	<b>-7.97</b>	9.03

Further analysis reveals that incremental changes of reforestation raise CS up to 50 % of reforestation. However, if farmers were asked to increase the reforested share of their land from 50% to 75% or 100%, this would be considered as losses in welfare. In other words, if each farmer was required to reforest 100 % of his land instead of 25%, each farmer would require around Rp 23 million per hectare to compensate for his losses. Compared to the average income of Rp 8 million per year and an average plot size of 4.3 hectares, this compensation of Rp 23 million over 5 years per hectare (Rp 4.6 million per year per hectare) seems reasonable, especially considering the heavy reliance on agriculture of most respondents. Compensation in terms of extension services can only compensate farmers in shallow peat areas for the costs of turning to sustainable farming practices. Probably the usefulness of such services does not provide an increase in yield that is high enough to cover the losses.

The information on marginal rates of substitution can furthermore be used to calculate the welfare changes resulting from different policy scenarios. Table 6.5 gives the Consumer Surplus, or the change in welfare of farmers, for different scenarios A and B. Basically, these CS are calculated by summing up the marginal rates of substitution related to each of the attribute changes in the scenario. For instance, scenario A shows that planting 50% of land with trees, allowing for the controlled use of fire, not asking people to participate in community days and providing six extra days of extension services per

<sup>8</sup> This should not be interpreted as an opportunity cost of Rp 2.5 million per community day spent. Regarding the fact that the micro-credit has a period of 5 years, which equals 10 planting seasons, the cost per day is around Rp 0.25 million per day per hectare.



planting season increases welfare by Rp 46 million per hectare per household to consumer surplus compared to the baseline scenario. However, scenario B, in which farmers are asked to reforest 100% of their land, are allowed to use controlled fire, have to contribute 2 days per planting season in community services, and are provided with 3 days of extra extension services per planting season, decreases welfare by Rp 15 mln/ha/hh compared to the baseline scenario. In other words, farmers would have to be given a grant of Rp 15 mln/ha/hh to compensate them for the policy scenario B. In scenario A, farmers would not need financial compensation in the long term. The calculations here are based on sample averages. The numbers in brackets show the standard errors related to the consumer surplus of each scenario.

If these were the alternatives presented to the total population, 59% would choose scenario A, 17% would choose scenario B, and 23% would opt for the baseline situation.

*Table 6.5 Economic valuation results.*

	Scenario A	Scenario B	Baseline
Reforestation	50 % trees	100 % trees	25 % trees
Fire use	'controlled fire'	'controlled fire'	No fire
Community services	0 days	2 days	0 days
Money	No compensation	No compensation	No compensation
Extension services	6 days	3 days	0 days
Market share	59%	17%	23%
Consumer surplus (mln Rp)	-35.48 (15.58)	25.22 (11.08)	10.47 (6.57)

## 6.5 Conclusion

The main objective of the choice experiment was to estimate the economic value that local communities derive from peatland, and the changes in their welfare they will live when peatland policies change and they have to change their farming practices. This choice experiment gives specific information on the compensation farmers would need to cooperate in reforestation of the CKP area and the ban on fire.

The results show that farmers expect to incur considerable losses due to the ban on fire and prefer being allowed to continue using fire in a controlled manner. They are generally willing to change their current practise, but only up to a certain level and only if compensation is offered. Changing their agricultural or wasteland into forested land generates benefits up to the point where half of the land is used for agriculture and the other half for planting trees. Any further reforestation would cause losses and require compensation. It would require a one-time micro-credit of around Rp 23 million per hectare for each farmer to change his entire land use to planting trees and refrain from using fire. Villages that do not participate in the CKPP project require higher compensation than villages in which one of the CKPP partners is active.

Compared to the average income of Rp 8 million per year and an average plot size of 4.3 hectares, this compensation of Rp 23 million in 5 years per hectare seems reasonable, especially considering the heavy reliance on agriculture of most respondents. However,

such number should only be used with great caution, taking into account the explorative nature of this study.

Important lessons can be learned from results of the choice experiment for developing successful peatland management policies. The results suggest that awareness of new sustainable practices increases the willingness to reforest part of the land. New projects should therefore work on education on sustainability and the broad scope of values of peatlands that fall to local communities, including health aspects. Compensation in terms of a micro-credit type of grant-loan is much preferred over extension services. Extension services are more appreciated by farmers living in shallow peat areas, a result which again rather seems to reflect the effect of experience of transmigrants with these services than the added value extension officers would have in such areas due to soil impacts. In combination with the results of the previous chapter, the results of the CE suggest that training and education are appreciated, be it dependent on the farmers' income and type of soil they are cultivating. A combination of both financial help and technical training is likely to be more viable for successful implementation of new policies. The results as presented in Chapter 5 however, seem to suggest that other types of non-monetary in-kind compensation, such as mechanical tools, seeds, fertilizer and pesticides might generate more direct value to farmers.

A well-known problem of community projects is that the successes evaporate when the donor leaves. In this case, the compensation offered to farmers was a 5-year grant, which they would be required to pay back if they hadn't successfully switched from agriculture to planting trees. The study has not addressed the question which follow-up activities would be needed to ensure the sustainability of the reforestation efforts after those 5 years. Lack of knowledge or marketability of the new species might ask for further compensation after the initial investment period.



## 7. Conclusions and recommendations

Peatlands are the most efficient terrestrial ecosystems in storing carbon on earth. Indonesia, which has approximately 50% of worlds' total tropical peatlands, together with Malaysia emit around 2 billion tonnes of CO<sub>2</sub>-eq. annually, representing a potential economic value of €10 billion to €40 billion (Wetlands International, 2007). Peatland degradation, deforestation and fires are the main causes of these considerable greenhouse gas emissions.

The objective of the study is to estimate the socio-economic value of peatland resources in Central Kalimantan from the perspective of local communities. In order to meet this objective, several issues were studied. First, the current socio-economic situation of communities living in degraded peatlands of Central Kalimantan was determined. Second, the attitudes on peatland conservation and restoration measures, was explored. Third, the compensation amount needed by local farmers to contribute to peatland restoration was estimated.

The time and means available to conduct this study were rather limited. Therefore, the outcome of the study should mainly be considered of an explorative nature. These results are a very first step in supporting the design of policies and measures for peatland restoration and conservation that would be favoured by local communities. Moreover, these results add information needed to attract financial donors that are considering participation in various schemes, by providing information about wider economic, social and ecological benefits of peatlands and comparing those to the needs and requirements of local communities as key stakeholders.

### 7.1 General lessons learned

By combining the results of the qualitative and quantitative approaches followed in this study, a number of valuable insights have been gained that are essential in designing an effective conservation strategy that would be supported by local communities. These are presented in the following.

- *Peatland forests provide multiple values and benefits:* Besides being an important carbon sink, peatlands also play critical role in biodiversity conservation and hydrological regulation. Valuing these ecological functions in economic terms is extremely difficult because of the multitude of economic functions that peatlands support. Moreover, estimating the monetary value of healthy peatlands insufficiently reflects its societal value. Peatlands can also play an important role in alleviating poverty. Currently poverty levels in degraded peatlands are 2 to 4 times higher than in the rest of Indonesia. Therefore, any intervention in peatland areas, should consider both environmental and socio-economic needs. At the same time, this also implies that any peatland conservation project might bring much more than just the benefit of the prevention of climate change and biodiversity loss.
- *Opportunity costs of peatland conservation are crucial:* Common peatland restoration and conservation measures include restoring water levels, fighting fires and replanting native species. Yet, the direct funds of building dams, hiring fire brigades

or building and planting nursery are not the only societal costs. The implementation of such measures often implies the need to stop unsustainable agricultural, forestry and other practices, which usually is not favoured by local farmers and may cause income loss. Therefore, creating the incentives for farmers to switch to more sustainable practices may actually constitute the major cost for a restoration project, but will also increase cooperation among farmers and thereby the success of the project. Identifying the value of current practices, needs and attitudes of these stakeholders is a crucial first step in designing strategies and estimating costs for effective interventions. The results of this project provide information to this first step.

- *Agriculture is the main entry point for peatland conservation:* Peat swamp forests were valued by the majority of local communities for many more reasons than just timber and non-timber products and therefore were protected by traditional laws. Currently 70% of household income comes from farming and forestry, and as much as 57% of households farm solely for subsistence purposes. Therefore, any change that affects agriculture, such as blocking canals or reducing the use of fire, is viewed upon as very critical. This may imply that providing alternative sources of income and food is crucial in convincing farmers to switch to more sustainable practices.
- *Local communities support reforestation but question conservation measures:* The majority of the interviewed farmers are supportive to peatland conservation, but more critical towards the measures to achieve it. Although farmers do not always comprehend the full scale of impacts of deforestation and fires, most of them have experienced the direct effects of these trends on their own wellbeing and 55% of the respondents suffered from fires in the past. Therefore, most farmers agree that peatland conservation is a good idea, especially for future generations. Still, people are sceptical when talking about concrete steps in their own villages. The majority of them fear that conservation measures might not be accompanied by compensations and think that it may ultimately result in lower levels of welfare.
- *Farmers are willing to switch to sustainable practices:* It is still possible to gain the support of local communities if the changes are perceived as beneficial and secure in terms of long-term income and food supply. The household survey also showed that only two thirds of the respondents appeared to be able to use the land in a profitable manner. This suggests that people should be in desperate need for solutions and therefore might be interested in cooperation. It corresponds to the findings of the household survey, which showed, that 33% of farmers are willing to switch from agriculture to growing trees and even 64% do partially. Communities who are less dependent on agriculture alone are also more open to switching land-use. Changing agricultural or wasteland into forested land generates benefits up to the point where half of the land is used for agriculture and the other half for planting trees. Any further reforestation would cause losses and require compensation.
- *Compensation is needed:* Sustainable peatland management may imply restrictions and thereby incur costs on farmers, which need to be compensated for to ensure that unsustainable practices and forest use do not continue. The fieldwork results show that compensation is a prerequisite for farmers to cooperate in a reforestation project. The farmers support loan-grant schemes, but have hardly any experience with such schemes and lack trust. Other types of compensation that farmers need is technical

support in terms of machinery and equipment, and fertilizer, seeds and pesticides. Training and extension services are regarded less important, but farmers still prefer training on fire fighting and planting and harvesting techniques. Such skills might be extremely important if new tree and crop species are to be planted.

- *Economic losses and benefits:* Changing land-use to tree planting with cooperation of farmers requires financial compensation, for instance by a micro-credit or loan-grant scheme. The results of the choice experiment suggest that farmers would need around Rp 15 million Rupiahs per hectare if they were required to reforest 100% of their land. This compensation would cover the increased costs of switching crops and ensure food and income supply over a period of 5 years. However, this may not cover any further assistance that is needed after this initial period. To ensure that the reforested areas remain intact, the new trees and crop species should provide enough income. Not only the land yield should be sufficient, but also market conditions (demand for the new species, market access, infrastructure) should be favourable.
- *Heterogeneity in attitude and perception is limited:* The heterogeneity of the population in Central Kalimantan forced the study to take a critical look at the impact of specific characteristics of the communities on the attitude and perceptions with regard to peatland conservation. In general, however, the above findings appeared to be quite similar across the sample. Still, several characteristics indeed influenced the final results.
  - *Geographical location:* The location determines land type, land cover, market access, infrastructure and other factors. Therefore, villages that mostly lay on deep peat areas, with extremely difficult conditions for agriculture, can possibly be more willing for cooperation than other. The same applies for villages that do suffer from fires and those that do not. Indeed, the findings highlighted some influence on willingness to collaborate, be it a small impact.
  - *Ethnicity:* Ethnical background has very little influence on the attitudes and perceptions of peatland conservation measures. A few difference to mention are more negative attitude towards building dams, but this can also be explained because of lack of awareness of positive impacts of dams. Therefore, there is no immediate need to distinguish policies and projects for communities with different ethical backgrounds. The literature indicates that these differences were much more distinct at the beginning of transmigration programs: transmigrants increased the pressure on natural resources by implementing unsustainable practices as a result of the lack of knowledge on peatland ecosystem. New projects may therefore indeed face similar differences in attitude between ethnic groups.
  - *CKPP involvement:* Involvement into CKPP project also did not have much influence on the attitudes of the communities. Nevertheless, people from the villages, in which the dams were already blocked, were much more positive about these measures to compare to other villages. This lesson confirms the notion that information and real life examples greatly influence the perceptions of people. Other measures, such as the fire ban, could benefit from this lesson. For re-forestation, however, this may be of lesser importance since most people associate reforestation with a threat to loose agricultural land (which in many cases means losing main source of income and food). Therefore, besides creating

awareness, reforestation measures have to go hand in hand with arrangements that secure a stable income/food supply.

## 7.2 Recommendations

Restoring water tables, controlling use of fire or re-forestation should go hand in hand with measures addressing root causes. Although many of them are very political and difficult to address, there are some that can and should be tackled by those directly working with local communities. Some recommendations are as follows.

- *Actively supply information in an appropriate form:* Information is a scarce but crucial factor in people's lives in Central Kalimantan. However, limited infrastructure and the low level of education, severely limit the access to knowledge and information. Provision of information appeared to play a major role in forming the attitudes and perceptions of local communities towards peatland conservation. As mentioned earlier, information about the features of peatland and ecological services it provides to local communities really changed the way people perceived peatlands.
- *Widen the focus of the interventions:* Interventions should pay attention to the interests of other stakeholders, who might be gaining profit from the unsustainable exploitation of natural resources (i.e. middlemen, governmental institutions). Due to high level of corruption and poor legal and institutional system, these secondary stakeholders may become a critical barrier in the success of conservation measures. At the same time, the political conditions should also ensure that local communities are empowered and can influence decision-making at higher scales.
- *Create a system of secure tenure rights:* The findings show, that 78% of farmers owned their land or the part of it. Nevertheless, their attitude about the safety of this tenure remains unclear. Moreover, the remaining 22% did not have ownership rights, which, according to many studies discourage any kind of investments into long-term changes. The literature convincingly shows that clear ownership encourages sustainable management of property in general.
- *Reduce the risk of not having income/food:* Stable income/food supply is an essential requirement that can hardly be compensated for. Most farmers perceive sacrificing agricultural land for peatland conservation programmes as increased vulnerability for food security. Therefore, farmers like to make available only part of their land for reforestation purposes. Therefore, projects that encourage a switching from agriculture to other forms of livelihood activities should simultaneously consider arrangements for food supply.
- *Reduce the risk of not having income/food:* Stable income/food supply is an essential requirement that can hardly be compensated for. Most farmers perceive sacrificing agricultural land for peatland conservation programmes as increased vulnerability for food security and therefore strongly prefer to give just a part of their land for reforestation purposes. After all, it takes time for forest to grow and start generating income. Moreover sustainable forestry (and especially when it is cultivated just on the part of the land that is owned) might be not sufficient to sustain whole families. To increase the chance of the success of reforestation project it is important to ensure that people have enough income and food till the time they can start generating money from the

forest as well as afterward this point in time. New trees and crop species (which possible could still be cultivated alongside the forest) should provide enough income. Therefore, it is also important to focus on research and development of the most sustainable methods of agriculture in the local environment and within given market conditions. Not only the land yield should be sufficient, but also market conditions (demand for the new species, market access, infrastructure) should be favorable.

- *Provide financial incentives:* The current low level of income of most farmers in Central Kalimantan make local communities susceptible to notion of switching to more sustainable practices. The average household income measured was less than Rp 8 million (US\$850) per year. However, it is critical that farmers trust that these alternative practices provide at least similar income levels. Therefore, financial incentives are needed to compensate farmers for lost revenues. This study suggests that farmers need around Rp 23 million per hectare to reforest 100% of their land over a period of 5 years in financial assistance. Extension services alone are not valued highly and are not considered to be useful enough to overcome all income loss.
- *Provide the support in the most needed form:* Depending on the village, various forms of compensation are appropriate. Although at least part of support is expected in cash, fertilizers, seeds or nursery (for wet trees or rubber) and non-mechanical tools are requested as well, and in some cases even preferred to money. Food, school fees and housing could, all of which were mentioned as the amenities people lack the most, also seem to be popular forms of compensation.
- *Increase transparency:* Transparent decision-making and financial management is crucial for the success of a conservation programme. The majority of the villagers are extremely sceptical about any financial or material support, as they do not believe that it can eventually reach them. Middlemen, and especially head of the village, generally don't have a good reputation in this region. Therefore avoiding middlemen as much as possible is highly recommended.
- *Intensify coordination between the action of (N)GOs:* The field study confirmed that majority of current interventions by NGOs as well as the their ideas and principles towards peatland conservation (e.g. developing and executing projects with a long-term vision, increasing the awareness of stakeholders, applying precautionary approach) are correct and should be widely accepted and applied. The diversity of activities taking place by the various NGOs in the various areas is large. Therefore, intensified coordination between the active NGOs, such as is strived for in the CKPP, is essential.
- *Long-term strategy:* Projects should be developed with a long-term vision in mind. Providing farmers with compensation in the first years might not be enough to ensure food and income in the longer-run. Without a long-term poverty reduction strategy, people may find themselves forced to return to unsustainable farming practices and overexploit the reforested areas. Therefore, projects that stimulate the cultivation of new species should ensure that the right market conditions are in place or developed.





## References

- ASEAN (2007). *Rehabilitation and sustainable use of peatlands in South East Asia*. Full Project Brief for International Fund for Agricultural Development and Global Environment Facility
- ASEAN (2006). *Rehabilitation and sustainable use of peatlands in South East Asia*. Full Project Brief for International Fund for Agricultural Development and Global Environment Facility. Appendix J: Summary of Country Components.
- Boehm, H.D.V., Siegert & F. (2001). *Ecological Impact of the One Million Hectare Rice Project in Central Kalimantan, Indonesia, Using Remote Sensing and GIS*.
- Colchester, M. (2004). *Strengthening the social component of a definition of legal wood origin and production for Indonesia*. Prepared for TNC's Indonesia Program.
- Contreras-Hermosilla A., Fay, C., Effendi, E., Thamrin, J., Sembiring, S. & Sirait, M. (2005). *Strengthening forest management in Indonesia through land tenure reform: issues and framework for action*. World Agroforestry Centre and Forest Trends.
- Harris, E. (2006). *The voluntary carbon market: current & future market status, and implications for development benefits*. Working paper for IIED & nef round-table discussion.
- Heyde, J., Wiken, Ed., Rusila Noor, Y. & Parish, F. (2005). *Climate Change, Forest and Peatlands in Indonesia*. Project Information Sheet.
- Hooijer, A., Silvius, M., Wösten, H. & Page, S. (2006). *PEAT-CO<sub>2</sub>, Assessment of CO<sub>2</sub> emissions from drained peatlands in SE Asia*. Delft Hydraulics report.
- Joosten, H. & Clarke, D. (2002). *Wise Use of Mires and Peatlands – Background and Principles including a Framework for Decision-Making*. International Mire Conservation Group and International Peat Society (eds). Greifswald, Germany: International Mire Conservation Group, 304 pages.
- Landell-Mills, N. & Porras, I.T. (2002). *Silver bullet or fools' gold? A global review of markets for forest environmental services and their impact to the poor*. London: The International Institute for Environment and Development (IIED), 249 pp.
- Langner, A. & Siegert, F. (2007). *The role of fire on land cover changes in Borneo*. Presentation.
- Miyamoto, M. (2005). *Forest conversion to rubber around Sumatran villages in Indonesia: Comparing the impacts of road construction, transmigration projects and population*.
- Page, S., Siegert, F., Rieley, J.O, Boehm, H.D, Jaya, A. & Limin, S. (2002). The amount of carbon released from peat and forest fires in Indonesia during 1997. *Nature*, 420, 61-65.
- Page, S.E., Rieley, J.O. (1998). *Tropical Peatlands: A Review of Their Natural Resource Functions, with Particular Reference to Southeast Asia*. *International Peat Journal*, 8, 95-106.
- PEACE. (2007). *Indonesia and Climate Change: Current Status and Policies*.
- Powe, N.A., Garrod, G.D. & McMahon, P.L. (2005). Mixing methods within stated preference environmental valuation: choice experiments and post-questionnaire qualitative analysis. *Ecological Economics*, 52, 513-526.
- Rubin, H. & Rubin, I. (2005). *Qualitative interviewing: the art of hearing data*, Thousand Oaks, Calif.: SAGE.
- Seidel, J. (1998). *Qualitative Data Analysis*. [www.qualisresearch.com](http://www.qualisresearch.com)
- Silvius, M. & Diemont, H. (2007). *Peatlands, climate change, poverty, biofuels, pulp and reduced emissions from deforestation and degradation*.

- Suyanto, S., Leimona, B., Permana, R.P. & Chandler, F.J.C. (2005). *Developing Mechanisms for Rewarding the Upland Poor in Asia for Environmental Services They Provide*. World Agroforestry Center.
- Tacconi, L., Moore, P.F. & Kaimowitz, D. (2006). Fires in tropical forests – what is really the problem? Lessons from Indonesia. *Journal Mitigation and Adaptation for Global Change*, 12(1). The Netherlands: Springer.
- Wetlands International (2007). *Assessment on Peatlands, Biodiversity and Climate Change*.
- Wetlands International (2004). *Maps of Peatland Distribution and Carbon Content in Kalimantan, 2000-2002*. The Netherlands.
- Wiken, E., Heyde, J., Noor, R.J. (WI), Ngurah, I.N., Suryadiputra, Dohong A., Cinq-Mars, J. & Latsch, C. (2004). *Restoration of orangutan habitats in the peatland forsts of Indonesia*. Paper Prepared for Presentation at The 16th Annual Conference of the Society for Ecological Restoration
- Woodhouse A. (2002). *Village corruption in Indonesia. Fighting corruption in the World Bank's Kecamatan Development Program*.
- WWF. (2005). *Borneo: Treasure Island at Risk. Status of Forest, Wildlife and Related Threats on The Island of Borneo*. Frankfurt am Main: WWF Germany.

### Web pages

- ASEAN portal : <http://www.aseansec.org/>
- Bio-rights portal: <http://www.bio-rights.com/>
- BOSF portal: <http://www.orangutan.com/>
- CARE International Indonesia: <http://www.careindonesia.or.id/>
- Central Kalimantan Peatlands Project (CKPP): <http://www.ckpp.org/>
- Peat-portal: <http://www.peat-portal.net/>
- The World Bank: <http://www.worldbank.org/>
- UNEP/GRID-Arendal Maps and Graphics library: <http://maps.grida.no/>
- Wetlands International portal: <http://www.wetlands.org/>
- WWF portal: <http://www.worldwildlife.org/>

## Appendix I. Questions for Focus groups

### Fire

1. Did you use fire on your land before the ban?
2. Do you still use fire on your land?
3. Have you heard about the ban on fire?
4. Do the local authorities allow the use of fire?
5. Does anyone check if you use fire?
6. Are you afraid of the penalties linked to the ban on fire?
7. Has your income decreased because of the ban on fire?
8. What would happen if the police would not let you use fire at all?
9. Were there many fires; was it a reoccurring problem?
10. How often do fires occur in this area?
11. Does the fact that there is no fire this year have anything to do with the ban on fire?
12. Who causes the uncontrolled fires?
13. How come the fire spreads?
14. But since the ban on fire you are no longer allowed to use fire, so what do you do now?
15. How do you clear your land now, without using fire?
16. Is this much more difficult than using fire?
17. What do you use now instead of ashes?
18. How do you feel about the ban on fire?
19. If you would know about other methods for doing this, would you be willing to stop using fire?
20. If you could afford to buy fertilizers, would you stop using ashes?
21. If you were to receive fertilizers, would you then stop using ashes?
22. Are there any conditions under which you would be willing to stop using fire?
23. What are the conditions for you to stop using fire?
24. What would you need in order to stop using fire?
25. How do you think the fire problem could be solved?
26. What kind of solution from the government would you propose?
27. Have you managed to clear all of your land this year?

### Dams

28. Are there any canals in this area?
29. Do you use the canals around here?
30. What do you use them for?
31. Would you agree with building dams in these canals?
32. What would happen if someone (e.g. a NGO) would build dams in the canals surrounding your village?
33. Would a dam be left in place?
34. But how about if the dams could be opened and closed, like a sluice system?
35. WI has built a dam near here, do you know about this?
36. Do you expect any problems with flooding this coming wet season?
37. If WI were to close all the canals in this area, would that be ok?
38. What advantages to the dams have for you?
39. If WI were to close all the canals in this area, would that be ok?
40. Do you feel you were well informed about the plans to build dams?
41. WI builds dams in this area; do you know about this?
42. Did you have any problems with floods before the canals were built?
43. Do you think it would be beneficial to you to block these canals?
44. So would you agree to close all of them then?

### Land use and land use change

45. What kind of crops do you grow on your peat land?
46. What do you grow on the rest of your land?
47. Why do you not grow anything on the deeper peat soil?
48. Do you ever plan to grow anything on the deeper peat?
49. Would you be willing to shift from rubber trees and rice to wet trees?
50. How about growing wet trees on part of your land?
51. These wet trees take a long time to harvest, would you still be willing to plant them?
52. Would you be willing to plant trees if there is a market for it?
53. Do you harvest trees from the forest?
54. Do you harvest the trees that grow on the unproductive land?
55. What activities do you do apart from the rubber nursery / agriculture?
56. If you do not have ashes or fertilizer, how do you grow crops?
57. Do you use fertilizers?
58. Do you drain your land?
59. Is your peat very dry?
60. How come the peat is so dry in this area?

### Compensations/financial schemes

61. Would you be willing to plant wet trees if you would receive compensation for the years you have to wait to harvest?
62. How about if you could get a loan for the years in which you have to wait, which could become a grant if you are successful in growing trees?
63. Explanation of the credit-loan-grant scheme, could you agree with this?
64. Do you think this kind of credit scheme could work?
65. What would you prefer, doing community services or paying interest?
66. Why?
67. How many days a month do you currently do community services?

### Trust

68. Do you believe that the compensation would actually reach the farmers?
69. Do you think you can have any influence in the governmental decision-making process?
70. Do you believe that the government will provide a solution for your situation?
71. Would you mind having a middleman between yourself and the organization providing the compensation?
72. If an organization were to introduce such a credit scheme, do you believe the money will actually reach you?
73. Who would you prefer to receive the loan from, the government or an organization?

### Trainings

74. Would you be willing to participate in peat land conservation activities as fire prevention teams?
75. What kind of trainings would you need?
76. Would you need anything in order to plant these trees (e.g. trainings, tools)?

## Appendix II. Household questionnaire

This survey pertains to the Central Kalimantan Peatland Project on the economic value of peatlands in Central Kalimantan. This is an independent study and your answers and identity will be held in strict confidentiality.

Your opinion and cooperation is very important for the successful completion of this study. The main objective of this survey is to find out the perception of the people living in the peatland area regarding the agricultural development plans for this area.

Your household was randomly selected to be part of the study. The survey will take about 40 minutes. We would like to request that only the household head (adult) should answer this questionnaire: household members can help, but nobody outside the household should be involved in the interview. There is no right or wrong answer to the questions: we only want your honest opinion.

Name interviewer	
Date	
Location	
Time start	
Time end	
Questionnaire number	

***Only include respondents who:***

- ***use peatland for agricultural or as unproductive land; OR***
- ***used peatland for agriculture before the ban on fire was introduced***

<b>Part 1: Farming practices</b>
----------------------------------

1. How much land do you use for:		2. Do you know what type of peat-land your plot is? a. Deep peat (>3m) b. shallow peatland (< 3M) c. Mineral soil d. Other, specify ....
a. Farming (agriculture):	.....hectares	
b. Planting trees (rubber, etc)	.....hectares	
c. Unproductive land	.....hectares	

3. What type of cultivation do you do? *[combinations possible]*

- a. Shifting cultivation
- b. Permanent cultivation
- c. Agro-forestry

4. Have you harvested any crop during the last 12 months?

- a. Yes
- b. No

5. What kind of plants do you grow? *[combinations possible]*

- a. Fruits
- b. Vegetables
- c. Rice
- d. Trees (for example,.....)
- e. Other, please specify .....

<b>Part 2: Involvement in current support and development programmes</b>
--

6. Did you ever receive any form support from the government since 1995?

- a. Yes
- b. No (skip next question -> go to Q 8)

7. If yes, what kind of support did you get, how much and when?  
*[only fill in the Rp amount if applicable]*

	Support		Amount	Year:
a.	Subsidy	I. transmigrant subsidy	Rp. ....	.....
		II. food subsidy (rice)	Rp. ....	.....
		III. farmers community support	Rp. ....	.....
		IV. other, please specify		
b.	Soft-loan		Rp. ....	.....

8. Have you ever participated in any bio rights or micro credit scheme from a Non Governmental Organisation?

- a. Yes -> go to Q 10
- b. No

9. How did you use the loan? *[combinations possible]*

- a. The loan was only for a predetermined use: please specify.....
- b. Set up a business
- c. For house construction
- d. Pay for schooling
- e. Other specify ...

10. Are the extension services available in your community?

- a. Yes
- b. No -> go to Q 13

11. If yes, how often have you personally made use of these services?

- a. Never -> go to Q 13
- b. Once per year;
- c. Once per planting period (2 times per year);
- d. Once per month;
- e. Once per week or more often.

12. If yes, what kind of support did you or your farmers organisation get from the extension officer? *[combinations possible] [show the card in the binder]*

- a. Assisting in handling farming technology, land use techniques, pests and diseases problems;
- b. Training in preparing the proposal for a micro-credit scheme;
- c. Helping with the marketing of the agricultural products.

13. Have you participated in any of the following Central Kalimantan Peatland Project activities? *[combinations possible] [show the card in the binder]*



- a. Fire brigade;
- b. Growing Alternative crops, e.g. melon;
- c. Dam building/canal blocking;
- d. Local plants nursery: Jelutung, rubber, balangiran, etc;
- e. Maintenance of climatology stations;
- f. Other, please specify .....
- g. None.

**Part 3: experience and opinion on fire ban and development plans**

[Read the following text to your respondent]

In the area of Central Kalimantan, 1,5 million hectares of peatland forest have been cleared for the Mega Rice Project. However, presently, only a small part of this area is used for agriculture.

Drainage of the peatlands has caused forest fires, especially in the dry season. The smoke of these fires causes local problems, such as health problems (respiratory diseases), property and crop damage, and impair children from going to school, and destroy much of the flora and fauna.

14. Have you (or any of your family members) ever suffered from forest/peatland fires?

- a. Yes
- b. No -> go to Q 16

15. If yes, who suffered and what was his/her problem?

- a. Person .....  
Problem: .....
- b. Person *[if applicable]*: .....  
Problem: .....

Possible problems:

Health, property damage,  
crop damage, schooling,  
etc.

16. According to you, what is the most important cause of the forest fires?  
*[only one answer possible] [show the card in the binder]*

- a. Nature (drier climate)
- b. Farmers, when clearing the land
- c. Smokers (through throwing burning cigarettes)
- d. Large scale plantation (oil palm)
- e. Other, please specify.....

*[Read the following text to your respondent] [show the card in the binder]*

The Central Kalimantan government has developed several plans:

- ban on the use of fire for land clearing
- reforestation of the peatland area
- establish fire-prevention teams
- block canals to prevent further drainage of peatlands.

The ban on fire prohibits everybody, including traditional farmers, plantation owners, to use fire for land clearing or making ash for fertilization. Any violation will be penalized with a fine or 6 months imprisonment.

What is your opinion on the restoration plans mentioned above: <i>[show the card in the binder]</i>	Positive, supportive	neutral	Negative, opposed	Don't know
17. The ban on fire				
18. reforestation of peatland area				
19. establish fire-prevention teams				
20. block canals				

21. Do you use fire for cultivating your land?

- a. Yes, I use fire.
- b. Yes, but only before the use of fire was forbidden.
- c. No, I don't (need to) use fire

22. Do you need receive some kind of compensation if the plans explained above are introduced?

- a. Yes
- b. No -> skip Q 23

23. What type of compensation do you need most and second most? *[show the card in the binder]*

Most needed	Second most needed
a. Money, grant or subsidy	a. Money, grant or subsidy
b. Seedlings, fertilizer and pesticides	b. Seedlings, fertilizer and pesticides
c. Material to build a house	c. Material to build a house
d. Mechanical assistance, tools	d. Mechanical assistance, tools

*[Read the following text to your respondent and show the card in the binder]*

Under the rehabilitation project, the CK 1.5 million hectares will partially be converted into commercial agricultural land, and partially into peatland forest.

The objective of these plans is to reduce if not eliminate forest fires and its resulting disasters, such as health problems and damages, conserve the peatland forest and its biodiversity, and reduce poverty in this area.

For the peatland forest, the plan includes the re-plantation of species such as rubber, jelutung, galam, gemor, sunkai, nyato, and balangiran, which can be harvested under strict conditions, e.g. **no logging is allowed**.

These plans will affect the life of farmers: you may not be allowed to use fire any longer and you may be asked to convert (part of) your agricultural land into peatland-forest. You may also be asked to assist extra days (so in addition to the days you are currently involved in community activities) in community activities to preserve peatland forest, such as in the fire-prevention teams, in the construction of dams in the drainage canals, establishing fish ponds and in planting and maintaining galam and purun.

To make this plan successful, farmers are expected to need assistance. This can be in terms of extension services, such as training in zero-burning clearing mechanisms. Another compensation possibility is micro-credit for forestry, so planting trees (seedlings, fertilizer, pesticides), for agriculture, and for support of your household. This credit will go directly to the farmer without the involvement of middle-men. All farmers in the area are eligible under this assistance programme; everybody can receive compensation, you don't need an official land property right/document.

24. Have you heard about the new Plan Inpres #2 2007: The revitalization and rehabilitation of the Mega Rice Project area?
- a. Yes
  - b. No
25. Would you be willing to switch from agriculture to planting trees like jelutung and gamar on your land?
- a. Yes
  - b. Yes, but only on part of my land
  - c. No

26. Could you indicate to what extent you agree with the following statements? <i>[tick one cell per row only][show the card in the binder]</i>	Agree	Neutral	Don't agree	Don't know
a. The peatland restoration plans will lead to lower welfare of my family if we don't receive compensation.				
b. My family would be willing to spend extra days in community activities to conserve peatland forests, (such as in the fire-prevention teams, in the construction of dams in the drainage canals, establishing fish ponds and in planting and maintaining galam and purun).				
c. Dams and blocking canals will give my family opportunities for fisheries.				
d. The ban on fire will improve the health situation of my family.				
e. The ban on fire will cause food problems for my family.				
f. Decisions on the ban on fire are well communicated. ("Socialized")				
g. My family can have influence in the policy making process of the peatland development plans.				
h. It is important for the future and future generations to conserve the peatland.				
i. I am afraid that my family will not receive compensation when the plans are introduced.				

## Part 4: Choice Experiment

*[read this text and show overview attributes and levels]*

This survey is to find out how much compensation is needed for farmers to help in re-establishing peatland forests on their land, stopping the use of fire for agricultural purposes and growing alternative crops. **Note that this part of the survey is only about the land that you currently use for agriculture and the part of your land that is unproductive.**

In the next questions, we will show you four different cards with two future options each, and the current situation. These two options are possible development plans, which might be implemented in this area in the future. You are asked to indicate which option you prefer most.

Each option is described by:

- the share of your agricultural and unproductive land that you convert to forestry land, so: where you are going to plant trees. If you use part of your land for trees, you are expected to continue planting trees on this land; you are not allowed to change that part to agricultural land. No logging is allowed. *[point at the pictures of land use and explain them]*
- to what extent you are allowed to use fire on your land: either no fire at all, or controlled fire.
- the number of extra days per planting season that you are asked to be involved in community activities to save the peatland area, such as in the fire prevention team, the construction of dams in the drainage canals, establishing fish ponds and in planting and maintaining galam and purun., etc.: zero, two or four days. This is in addition to your current involvement in community services. **Note that you do not receive direct financial rewards for this.**
- the amount of micro-credit that you can receive (one time). This money will go directly to the farmer, so to yourself, without the involvement of middle-men. You can use this micro-credit for forestry, so for planting trees (seedlings, fertilizer and pesticides), for agriculture, or to support your family (because you can use a smaller part of your land for crops to feed your family, and it takes time before the trees are grown and you can harvest). This credit is a loan for 5 years, which will become a grant only if you achieve to grow trees successfully on your land. **Your land will be checked to see that you have really planted extra trees. If you are not successful you will have to pay the money back.** *[point at the pictures of the credit and explain them]*
- the number of extra days per planting season that an extension officer will be available in your community to provide training in zero-burning systems, in cultivation of alternative crops (that grow well on peatland): zero, three or six days.

*[provide additional explanation if respondent does not understand the attributes]*

*[show the short text and the example card and explain it very thoroughly]*

First we will show you an example.

The first option you have to plant trees on  $\frac{3}{4}$  of your agricultural/ unproductive land. You can use  $\frac{1}{4}$  of the land for agriculture. Note that you cannot cut down the trees. If you are planting trees on other parts of your land, you are expected to continue using this land only for planting trees. You are not allowed to use fire: not for clearing, not for ashes. You are asked to help two extra days per planting season in community activities, in addition to the days you are currently involved in such activities. In return you will get a micro-credit of Rp 20,000,000 per hectare that you currently use that you can use to buy seedlings, pesticides and fertilizers. You will also get 6 extra days of extension services per planting season.

The first option you have to plant trees on  $\frac{3}{4}$  of your agricultural/ unproductive land. You can use  $\frac{1}{4}$  of the land for agriculture. Note that you cannot cut down the trees. If you are planting trees on other parts of your land, you are expected to continue using this land only for planting trees. You are allowed to use fire under strict control to clear your land and make ashes. You are asked to help four days per planting season in community activities, in addition to the days you are currently involved in such activities. In return, you will get a micro-credit of Rp 15,000,000 per hectare of land that you use. You won't get extra days help from the extension officer.

We would like to know which option you prefer: A or B or the current situation, so we want to know which option you think is best for you. This means that you will have to make a trade-off between the costs that you will have from using your land for trees (without logging), being involved in community activities and stopping the use of fire, and on the other hand the benefits of more extension services and micro-credit.

It may also be that you prefer none of the two options, and rather stay in your current situation. This implies that you can use your land as you currently use it. You won't have to help in community activities. However, you cannot use fire, you will receive no micro-credit, and no extra help from the extension officer.

**VERSION: ..... [very important!!!]**

27. Card 1: choice made:

- a. A
- b. B
- c. Current situation

28. Card 2: choice made:

- a. A
- b. B
- c. Current situation

29. Card 3: choice made:

- a. A
- b. B
- c. Current situation

30. Card 4: choice made:

- a. A
- b. B
- c. Current situation

31. *[only ask this question if the respondent has chosen 'c. current situation' four times]*

You have chosen the current situation at each card, so four times. Can you explain why?

- a. I don't believe I would really get the benefits
- b. The benefits do not compensate the income loss from switching to other land uses
- c. Other, please specify .....

32. In making your choices, what was most important to you? *[unless 'a. all items' is chosen, you can choose combinations - as many items as you like can be indicated]*

- a. I considered all items simultaneously
- b. I focussed mostly on the land-use shares
- c. I focussed mostly on the fire possibilities
- d. I focussed mostly on the community services
- e. I focussed mostly on the micro-credit
- f. I focussed mostly on the extension services

### Part 5: Household information

In this last part, you are asked several questions about your household's characteristics. We would like to remind you that we will treat your answers in strict confidentiality and you will not have to state your name or address.

33. Were you born in Central Kalimantan?

- a. Yes -> go to Q 36
- b. No

34. If not born here, where were you born?

- ☐ Other part of Kalimantan, please specify .....
- ☐ Java
- ☐ Sumatra
- ☐ Sulawesi
- ☐ Nusa Tenggara
- ☐ Other, please specify .....

35. If not born here, when did you arrive in Central Kalimantan?

.....

36. What is your age?

.... Years old

37. [fill in the gender of the respondent

- a. Male
- b. Female]

38. What is your highest educational attainment?

<input type="checkbox"/> No formal schooling
<input type="checkbox"/> Elementary
<input type="checkbox"/> High school
<input type="checkbox"/> Vocational
<input type="checkbox"/> College or Master's

39. Please list the number of household members per age group:

- a. Children (0-12 years of age): ....
- b. Teens (13-17 years of age): ....
- c. Adults (above 18 years of age): ....
- d. Total household members: ....



40. Do you own this land officially – do you have a property right?

- a. Yes, for all my land
- b. Yes, for part of my land
- c. No
- d. Other, please specify

41. How many years have you cultivated this land?

..... years / Since year .....

42. Do you use fertilizer?

a. Yes -> can you specify the costs per planting season?	Costs: Rp ..... per kg Kg per planting season: ..... Total costs per planting season: Rp .....
b. No -> go to Q 43	

43. Do you use pesticides?

a. Yes -> can you specify the costs per planting season?	Costs: Rp ..... per kg Kg per planting season: ..... Total costs per planting season: Rp .....
b. No -> go to Q 44	

44. How much of your harvest do you sell?

- a. Nothing
- b. 1 - 25 % [ $<1/4$ ]
- c. 25 - 50% [ $1/4 - 1/2$ ]
- d. 50 - 75 % [ $1/2 - 3/4$ ]
- e. 75 - 100 % [ $3/4 - \text{all}$ ]

45. Do you collect any other forest products (from outside your land) for own consumption or income generation?

- a. Yes
- b. No

46. Can you make a profit from the harvest of your land?

- a. Yes
- b. No

*[For question 47-52: if the respondent doesn't know the amount per year, write down the amount in a different time unit, calculate the amount per year, and **check with the respondent if this is correct**]*

<i>How much of your total household income comes from :</i>	<i><b>Rp per year</b></i>	<i><b>[use different time unit if necessary]</b></i>
47. agriculture	Rp	
48. Planting trees (e.g. jelutung)?	Rp	
49. fisheries	Rp	
50. permanent wage labour	Rp	
51. temporary wage labour	Rp	
52. other, please specify	Rp	
<b>Total</b>	<b>Rp</b>	

53. Is your income enough to sustain your family?

- a. Yes -> go to Q 54
- b. No -> skip Q 54

54. If no, what do you mainly lack?

- a. Food
- b. Housing
- c. Education for my children
- d. Health care

**THANK YOU FOR YOUR COOPERATION**



### Appendix III. Regulations

- a. Undang-Undang Nomor 23 Tahun 1997 tentang Pengelolaan Lingkungan Hidup (Lembaran Negara Republik Indonesia Tahun 1997 Nomor 60, Tambahan Lembaran Negara Nomor 3699), Pasal 6 ayat (1): Setiap orang berkewajiban memelihara kelestarian fungsi lingkungan hidup serta mencegah dan menanggulangi pencemaran dan perusakan lingkungan hidup / *The Constitution of The Republic of Indonesia No: 23/1997 regarding the Management of Life Environment, stating that every body is obliged to take care for the sustainability of the functions of the natural resources as well as prevent and solving the problems of pollution and natural resources damage;*
- b. Undang-Undang Nomor 41 Tahun 1999 tentang Kehutanan (Lembaran Negara Republik Indonesia Tahun 1999 Nomor 167, Tambahan Lembaran Negara Nomor 3888), pasal 49 “ Pemegang hak/izin bertanggung jawab atas terjadinya kebakaran hutan di areal kerjanya” Pasal 50 “ Setiap orang dilarang membakar hutan” / *The Constitution of The Republic of Indonesia No: 41/1999 regarding Forestry, article 49 stating that the Forest Concession Owners is responsible for the occurrence of forest fire within their areas, and article 50 stating that everybody is banned to burn forest;*
- c. Undang-Undang Nomor 18 Tahun 2004 tentang Perkebunan, pasal 25, “ Setiap pelaku usaha wajib mencegah kerusakan dan memelihara fungsi lingkungan hidup, pasal 26 “ Setiap pelaku usaha dalam membuka/mengolah lahan perkebunan dilarang dilakukan dengan dengan pembakaran” / *The Constitution of The Republic of Indonesia No: 18/2004 regarding Big Scale plantation, article 25 stating that every plantation owner is obliged to prevent natural damage and take care of natural resources functions. Article 26, Every Concessionaire must not use fire when open or manage the land;*
- d. Undang-Undang Nomor 4 Tahun 2001 tentang Pengendalian Kerusakan dan atau Pencemaran Lingkungan Hidup yang berkaitan dengan Kebakaran Hutan dan atau Lahan. Pasal 11, Setiap orang dilarang melakukan kegiatan pembakaran hutan / lahan. / *The Constitution of The Republic of Indonesia No: 4/2001 regarding the control of natural damage and or pollutions related to land and forest fire. Article 11, stating that every body is banned to set land and forest fires;*
- e. Peraturan Daerah (PERDA) Provinsi Kalimantan Tengah No 5 Tahun 2003, tentang Pencegahan dan Penanggulangan Kebakaran Hutan dan atau Lahan; / *Regulation of Central Kalimantan Province No: 5 / 2003 regarding Land and Forest fire prevention and suppression;*
- f. Peraturan Daerah Kota Palangka Raya, No: 07 Tahun 2003, tentang, tentang Pencegahan dan Penanggulangan Kebakaran Hutan dan atau Lahan / *Regulation of Palangka Raya Municipality No: 07 / 2003 regarding Land and Forest fire prevention and suppression;*
- g. Instruksi Presiden pada Sidang Kabinet terbatas tanggal 14 Juni 2007 / Presidential Instruction on Fire ban, June, 14<sup>th</sup> 2007;

- h. Governor of Central Kalimantan Instruction on Fire ban June 2007;
- i. Maklumat Kapolri kepada seluruh Kapolda di Provinsi rawan kebakaran hutan, yang pokoknya untuk melakukan tindakan tegas (repressive) kepada siapa saja yang terbukti bersalah melakukan pembakaran hutan, lahan dan pekarangan / *The order of Indonesian Police Chief to all of the Regional Police Chief to take repressive actions to every one who is proven guilty has set land and forest fire, as well as house yards.*